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Food hypersensitivity in the paediatric population.

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Abstract

Food hypersensitivity in the paediatric population.

Author: Maria Mariella Porter Abdilla

Food hypersensitivity refers to an adverse reaction to food at a dose which is tolerated by the majority of individuals (Johansson et al., 2001), which is further classified into allergic and non-allergic food-hypersensitivity (Skypla & Venter, 2009).

Research on food hypersensitivity in young children is minimal, with countries like Malta lacking any research on this topic. The reported prevalence of food hypersensitivity worldwide for the paediatric population to date in the 21st century ranges from 1% in the Denmark to 38.4% in Germany (Osterballe, Hansen, Mortz, Host, & Bindslev-Jensen, 2005; Roehr et al., 2004). With regards to available research on food hypersensitivity for the age group 4 to 6 years, parent reported prevalence ranges from 4.2 to 11.8% (Steinke et al., 2007; Venter et al., 2006), with the value going down to 2.5% when including research that reports a point prevalence based on food challenge and/or suggestive history and skin tests (Venter et al., 2006).

The main top food group causing food hypersensitivity in the paediatric population aged eighteen and under is reported to be cow's milk and milk products, with other food groups being country specific (Madsen, 2005).

Introduction

What is food hypersensitivity?

According to the European Academy of Allergy and Clinical Immunology (EAACI) Task Force, food hypersensitivity refers to an adverse reaction to food at a dose which is tolerated by the majority of individuals (Johansson et al., 2001). This umbrella term can then be branched into allergic hypersensitivity and non-allergic food-hypersensitivity, formerly referred to as intolerance (Skypla & Venter, 2009).

According to the EAACI Task Force, food allergies are caused by a food protein interacting with the immune system resulting in Immunoglobulin type E-mediated (IgE) and non-Immunoglobulin type E-mediated (non-IgE) reactions. In IgE-mediated allergies there is interaction between chemical mediators and various cell types where symptoms appear shortly after contact with or consumption of food (Ronald & Kleinman, 2014; Story, 2008). Anaphylaxis is the most severe symptom of IgE-mediated food allergy, with other symptoms affecting the mouth, face, gut, skin and respiratory tract (Vadas et al., 2008; Patriarca et al., 2009).

In non-IgE-mediated allergies, the reaction to food occurs hours or days after exposure, where there is an interaction between cells and chemical mediators (Johansson et al., 2001). This form of food allergy includes diseases ranging from atopic dermatitis to protein-induced enterocolitis, and eosinophilic esophagitis to coeliac disease (Ho, Wong, & Chang, 2014).

Ho et al. (2014) further include mixed IgE and non-IgE-mediated allergic hypersensitivity as a third type of food allergy. Figure 1 shows a schematic diagram of food hypersensitivity classification.

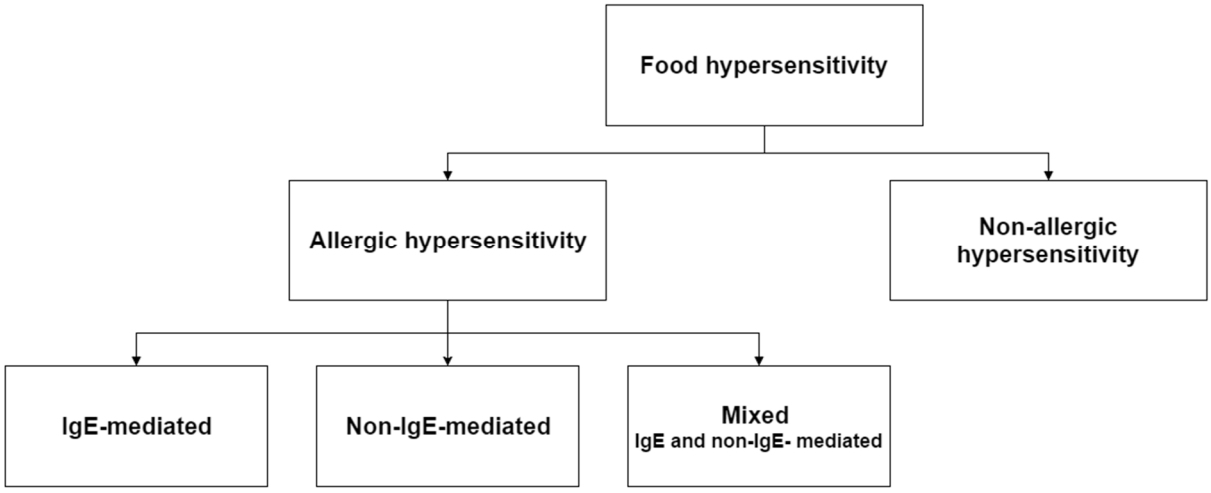

Figure 1. Classification of food hypersensitivity. Adapted from Johansson et al. (2001).

In mixed IgE and non-IgE-mediated allergic hypersensitivity there is an overlap of symptoms between the two forms of allergies, and this includes atopic eczema, allergic eosinophilic disorders and gastroesophageal reflux (Ho et al., 2014).

Non-allergic hypersensitivity is the body's reaction to natural substances in food or artificial chemicals, or due to enzyme deficiencies, where the body's immune system is not involved (Skypala & Venter, 2009). Tables 1 and 2 are summaries showing the spectrum of food hypersensitivity of different immunopathophysiology.

Table 1 *Spectrum of allergic food hypersensitivity of different immunopathophysiology*. Adapted from Ho, Wong & Chang (2014); Skypala & Venter (2009).

Allergic hypersensitivity		
IgE-mediated	**Non-IgE-mediated**	**Mixed IgE and non-IgE**
Anaphylaxis Cardiovascular - hypotension - vascular collapse - arrhythmia - oral allergy syndrome/ pollen food hypersensitivity syndrome Cutaneous - urticaria - angioedema Gastrointestinal - throat discomfort - mouth and tongue Itchiness - nausea - vomiting - abdominal cramps - diarrhoea Ocular conjunctivitis lacrimation periorbital oedema redness and itchiness of eyes Respiratory - asthma (cough, shortness of breath, decreased exercise tolerance wheezing) - rhinitis (sneezing, runny nose, nasal obstruction, itchy nose, cough, voice change)	Coeliac Disease Dermatitis herpetiformis Eosinophilic esophagitis Eosinophilic gastroenteritis Food induced pulmonary hemosiderosis Food protein-induced enterocolitis Food protein-induced enteropathy Proctitis Proctocolitis	Atopic eczema Allergic eosinophilic disorders: - allergic eosinophilic esophagitis -allergic eosinophilic gastroenteritis Gastroesophageal reflux

Table 2 *Spectrum of non-allergic food hypersensitivity of different immunopathophysiology*. Adapted from Patriarca et al. (2009); Skypala et al. (2015); Skypala & Venter (2009).

Non-allergic food hypersensitivity		
Enzyme deficiencies	**Natural substances**	**Food additives**
Lactase - meteorism, flatulence, nausea. Pancreatic (amylase, lipase, protease) - diarrhoea, meteorism, flatulence, nausea. Glucose-6-phosphate dehydrogenase - hemolysis	Carbohydrates (fructose, sorbitol) - meteorism, flatulence, nausea Benzoates - chronic urticaria, asthma, atopic dermatitis, rhinitis, anaphylaxis, flare around mouth Biogenic amines (beta-phenylethylamine, tyramine, tryptamine, putescine, cadaverine, spermine, spermidine, histamine) - increased gastric acid, increased heart rate, headache, urticaria, pruritus, tachycardia, bronchospasm, cardiac arrest. Salicylates - rhinitis, asthma, nasal polyposis, urticaria, gut inflammation. Caffeine - arrhythmia, gastrointestinal disturbances, insomnia, restlessness, headache, nervousness, sensory disturbances.	Sulphites - urticaria, angio-oedema, anaphylaxis, rhinitis. Benzoates - chronic urticaria, asthma, atopic dermatitis, rhinitis, anaphylaxis Monosodium glutamate - asthma, headache, urticaria, angio-oedema, rhinitis, psychiatric disorders, convulsions, flushing, headaches, abdominal symptoms, hyperactivity in children.

The underlying causes of food-induced hypersensitivity

Food allergy

Gene-environment interactions are likely the cause of IgE-mediated food allergies (Martino, Saffery, Allen, & Prescott, 2016). Genetic studies indicate that food allergies are the result of several gene modifications, resulting in allergies classified as polygenic disorders (Martino et al., 2016). Research by Hong et al. (2015) shows that the largest genetic predisposition in heritability of food allergies depends on functional polymorphism within the human leukocyte antigen (HLA)-*DQ* and *HLA-DR* gene areas. Researchers Tsai et al., (2009) report a heritability rate in food specific IgE allergy ranging between 15% to 30%, whilst Sicherer et al., (2000) report an approximate 80% heritability in a peanut allergy twin study.

The involvement of the environment in food allergies is shown through epidemiological studies which have recognised influencing factors including breastfeeding duration, type of birth delivery, modification in infant feeding practices, increase in processed food consumption, declining gut microbiota, and lower levels of Vitamin D due to increase in indoor activities (Brew et al., 2012; Zhang et al., 2016; Koplin et al., 2012; Moghaddam et al., 2014; Ling et al., 2014; Allen et al., 2013.) Yet in spite of the researched environmental influence, the fact that only a fraction of children exposed to these environmental allergy triggers develop an allergy, indicates that there is an underlying genetic predisposition. It can also be stated that the gene-environment interaction is even rather complex since individuals of different genotypes respond to their environment differently (Martino et al., 2016).

More recent studies in this field upgrade the gene-environment interactions model to epigenetic mechanisms of gene regulation as a component for food allergies (Martino et al., 2016). Epigenetic mechanisms are the result of contribution of both genes and environment

to underlying gene expression, with modification in DNA or DNA associated proteins influencing the phenotypic expression of the genome (Martino et al., 2016).

Yet a study by Toit et al. (2008) about peanut allergy shows how genetics is not the underlying cause of food allergies, but the timing of allergen introduction is. This research shows that 0.12% of Jewish primary school children aged 4 to 12 years raised in Israel were allergic to peanuts as opposed to 2.05% Jewish children of equivalent age group living in London. These researchers state that the lower prevalence in children raised in Israel is due to the cultural early exposure to high quantities of peanuts through traditional snacks. This observational study has been at the forefront to hypothesize that early consumption of peanuts can lead to oral tolerance. Amongst other studies that followed, there is The Learning Early About Peanut Allergy (LEAP) 2016 study carried out in the United Kingdom. The LEAP study by Feeney, et al. (2016) found that an earlier introduction of peanuts during the weaning process in infants who are high-risk for atopy, reduces the risk of developing peanut allergy. Clinically tested peanut allergy in the avoidance group was found to be 17.2% compared to 3.2% in the consumption group (Feeney et al., 2016).

Following the LEAP study, a study by Perkin et al. (2016) evaluated whether the introduction of allergenic foods prior six months, can reduce the risk of breast-fed infants from developing a food allergy. Yet this study results failed to show the effectiveness of introduction of highly allergenic foods in reducing the risk of food allergy, where Perkin et al. (2016) report that putative effectiveness depends on adherence of food consumption and dose.

With reference to non-IgE-mediated, and mixed IgE and non-IgE-mediated food allergies, to date the underlying cause/s are still not clearly understood in all cases (Wang & Sampson, 2009). Yet coeliac disease can be considered an exception, since this autoimmune disorder

has been confirmed to manifest in genetically susceptible individuals, triggered by gluten and associated prolamins amongst other environmental factors (Setty, Hormaza, & Guandalini, 2008).

Non-allergic food hypersensitivity

The interaction between genetics and environmental factors is only understood in a small fraction of non-allergic hypersensitivity cases (Hippe et al., 2014). One such case is lactose hypersensitivity, where the underlying genetic influence is quite unique. In humans, due to a genetic mutation lactase activity persists only in some individuals, with those who do not carry this mutant gene having a lower level of lactase released by the intestines and are more likely to be hypersensitive to lactose (Swallow, 2003).

Diagnosing food allergy and non-allergic food hypersensitivity

IgE-mediated food allergy

Following medical history and a physical examination, a blood sample and skin prick tests are useful in diagnosing IgE-mediated food induced hypersensitivity (Sampson et al., 2012). The specific IgE test mainly used is the Immunoassay Capture Test (ImmunoCAP), where specific IgE levels are measured and graded in levels from 1 to 6, with levels 2 or higher considered as a positive result (Fleischer, 2015; Skypala & Venter, 2009).

During skin prick test the food extract to which the patient is thought to be allergic, is placed on the patient's skin and pricked with a needle, together with histamine as a positive control to have an indication of skin reactivity, and saline as a negative control to be able to compare

wheal diameters (Hill, Heine, & Hosking, 2004; Skypala & Venter, 2009). Prick tests measure the specific IgE attached to mast cells in the skin and a result is considered positive when a 'wheal and flare' skin reaction is 3mm or larger in diameter than the negative control in children older than 2 years (Jackson, 2003; Samartin, Marcos, & Chandra, 2001; Skypala & Venter, 2009). A positive skin prick test only indicates that there is a 50% chance that the patient has an IgE-mediated allergy to the tested food, with negative results indicating that there is a 95% chance that the patient does not have an IgE-mediated food allergy (Skypala & Venter, 2009; Hill et al., 2004).

When the skin prick test and/or serum IgE is/are positive but less than 95% positive predictive value or 95% specificity, or when such results do not relate to history, a food challenge is carried out (Kattan & Wang, 2013). A double-blind placebo-controlled oral food challenge is considered the gold standard, where both the patient and the person performing the challenge do not know which food is being tested (Sampson et al., 2012). Yet since this gold standard is highly time consuming, for practical reasons most clinics perform the slightly less demanding open food challenges (Liebermann, Cox, Vitale & Sampson, 2011). During a food challenge there is always the risk of immediate allergic reactions and anaphylaxis (Perry, Matsui, Connover-Walker, & Wood, 2004). Such oral food challenge risks are preventable when allergen component-resolved diagnostics are used as a more accurate serum test, where pure allergen proteins are used and hence the risk of a false positive diminishes (Kattan & Wang, 2013). Such diagnostics have been mainly studies in peanut allergy cases, with clear indications of links between various peanut allergens components, the risk of clinical allergy, and the chance of tolerance (Kattan & Wang, 2013).

Following these tests, periodic assessment of a food allergy is usually recommended to evaluate the possibility of an outgrown allergy through a natural course (Fleischer, Conover-Walker, Matsui, & Wood, 2005).

Non-IgE- mediated food allergy

For the majority of food allergies for which Immunoglobulin type E is not responsible, allergen patch tests can be applied to a patient's skin for 48-72hrs, where any effects are evaluated (Niggemann, Reibel & Wahn, 2000). Exclusion diets are also considered as supportive diagnostic tests in this type of food allergy (Aceves, 2014).

In the case of coeliac disease serological markers vary between clinics. Yet in the majority of clinical settings, levels of Immunoglobulin class A (IgA) tissue transglutaminase together with total serum Immunoglobulin IgA, followed by serum levels of immunoglobulin A endomysium antibodies are measured (Setty et al., 2008). Considering that coeliac disease can present itself in various forms ranging from symptomatic to asymptomatic, Setty and colleagues have proposed a diagnostic procedure for coeliac disease as shown in Figure 2.

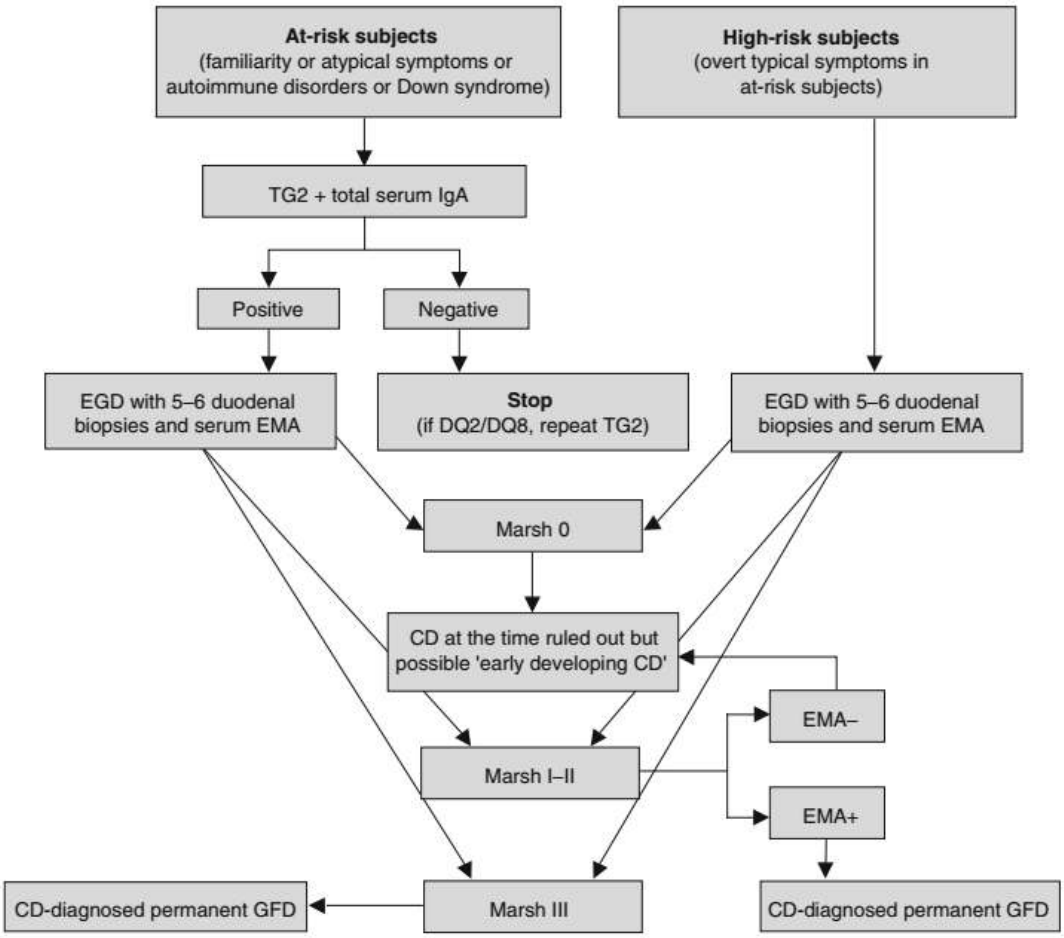

Figure 2. Proposed diagnostic algorithm for coeliac disease. Retrieved from Setty et al. (2008).

Note: CD: Coeliac Disease; DQ2/DQ8: Human leukocyte antigen DQ2 or DQ8 serotypes; EGD: esophagogastroduodenoscopy; EMA: endomysium antibodies-IgA; GFD: gluten-free diet; Ig: Immunoglobulin; Marsh: Marsh classification score for coeliac; TG2: tissue transglutaminase.

Non-allergic food hypersensitivity

Blood tests for serum IgG levels are frequently used by private clinics to test for non-allergic food hypersensitivity (Carling, 2014). Yet such tests have not been appropriately validated and more research should be allowed in this area before these test results are implemented (Ronald & Kleinman, 2014). Here diagnosis is based on an increase in serum IgG which is actually present when a patient consumes the specific food tested for (Stapel et al., 2008). Hence a patient can be presented with a list of food items for which a high IgG level was

detected and asked to exclude them from the diet, resulting in nutritional deficit and unnecessary stress (Skypala & Venter, 2009).

Other tests available to the public include kinesiology, hair analysis, leucocytotoxic/cytotoxic test, pulse test and electrodermal (Vega) test (Carling, 2014). Yet these tests are considered as non-validated procedures with no scientific value (Carling, 2014).

In the case of lactose hypersensitivity what is mostly used in a clinical setting is the hydrogen breath test following an oral load of lactose (Argnani et al., 2008). Here undigested lactose is fermented by bacteria in the colon and hydrogen is produced. Hence the significant presence of hydrogen in the breath provides an indication of lactase enzyme absence (Brown-Esters, Mc Namara, & Savaiano, 2012).

Eliminating lactose from the diet for a stipulated time is another option for identifying if a patient is lactose intolerant. Yet in some lactose intolerant patients such elimination does not always improve or eliminate symptoms completely due to further underlying causes such as irritable bowel syndrome or coeliac disease (Brown-Esters et al., 2012; Jankowiak & Ludwig, 2008).

For other non-allergic food hypersensitivity, diagnostic exclusion diets can be sufficient to identify the culprit food inducing hypersensitivity (Buttriss, 2002). These diets can range from a single-food exclusion diet, to multiple-food exclusion diet, few-foods diet, and elemental and protein hydrolysate formula diets (Skypala & Venter, 2009).

Prevalence of food hypersensitivity

Research on food hypersensitivity in young children is minimal, and there are even fewer population-based studies in this field.

A look at the reviewed studies on the prevalence of food hypersensitivity in the paediatric population aged eighteen years and under shows a vast range of reported prevalence. Research by Skypala and Venter (2009) states that the prevalence of food hypersensitivity in the paediatric population lies between 1.6% to 4%. Yet according to Jackson (2003) the prevalence in children is at a higher range between 5% and 8%. A review report by Pyrhonen, Nayha, Kaila, Hiltunen, and Laara (2009) reports a prevalence of food allergy and food hypersensitivity ranging between 2% and 35%, where the studies involved one to four year olds.

A varying factor amongst research in this area is the nomenclature used, where terms like 'allergy', 'perceived allergy' or 'food hypersensitivity' might not always adhere to the nomenclature proposed by the European Academy of Allergy and Clinical Immunology Task Force. The participants' interpretation of the term used could also have an impact on the resulting prevalence. In studies where the prevalence of parent reported food allergy is studied, there is a chance that respondents would include non-allergic food hypersensitivity cases in their answers. Amongst such studies there is that by Caffarelli et al., 2011 where reference is made to 'Parents' estimate of food allergy prevalence'; Jarpenpaa et al., (2014) who studied parent-reported food allergy in six and 7-year old children; Kallio, Salmivesi, Kainulainen, Paassilta, and Korpii, (2011) whose study is titled 'Parent-reported food allergy requiring an avoidance diet in children starting elementary school'; and that by Rance,

Grandmottet, and Grandjean (2005) who studied the prevalence of school children diagnosed with food allergies.

The diversity in the reported prevalence of food induced hypersensitivity is also a result of different age brackets under study, though inter-country diversity is still observed for the same age group. Table 3 shows the different age groups under study in the various reviewed research. Research involving children aged around the age of six years is discussed in more detail here-under.

Research by Venter et al. (2006) shows how 11.8% of 6 year olds in the Isle of Wight UK were reported by the parents to have some form of food hypersensitivity. Yet when the researchers carried out a food challenge and/or skin prick test and suggestive history, the prevalence went down to 2.5%. A study by the Institute for Applied Consumer Research (2004) involving ten European countries, showed how 4.2% of 4 to 6 year olds were reported by the parents to have food allergy (Steinke et al., 2007). Both research by Venter et al. (2006) and by Steinke et al. (2007) were reporting a point prevalence where only food induced hypersensitivity cases at the time of the study were taken into consideration. Yet whilst the research by Venter et al. (2006) reported all cases of food hypersensitivity, that by Steinke et al. (2007) reported prevalence of food allergy only. This could have led to the different prevalence values.

A 2013 study by Jarpenpaa et al. (2014) reports how 6.1% Finnish parents stated that their 6- to 7-yr-old children were allergic to at least one food, with 2.5% of the children under study being allergic to basic foods. This study followed the preceding 2009 research by Kallio et al. (2011), where parents reported that 9.2% of 6-to 7-yr-old Finnish children had some form of food allergy, with 2.7% being allergic to basic food.

As shown in Table 3, studies on the prevalence of food hypersensitivity within the paediatric population do not always involve a cohort that reflects the whole country. The research by Venter et al., (2006) on the Isle of Wight is the only one that involves all six year olds with birth dates between 1st September 1997 and 31st August 1998 who at the time of the study were attending school. The survey by the Institute for Applied Consumer Research in Cologne (2004) as part of the European research project 'Reduced Allergenicity in Processed Foods' involved a sample of 1:5,000 per country residents in the ten European countries under study. Whilst such an approach can produce an approximation of the whole country in large nations, it might not produce a large enough sample of participants in smaller countries.

Other studies tend to focus on a town or city and the results obtained should be interpreted with caution when referring to the country where the study is carried out. Such is the case for studies carried out in Finland. The 6.1% food hypersensitivity point prevalence for the study carried out in Tampere by Jarpenpaa et al., (2014) is comparable to the 9.2% point prevalence for the study carried out in the same town by Kallio et al. (2011). Yet there is a discrepancy in prevalence when compared to the 30% lifetime prevalence reported in the province of South Karelia in south-eastern Finland as part of The South Karelian Allergy Research Project (SKARP) reported by Pyrhonen et al. (2009). In addition, whilst the Tampere studies have measured point prevalence, the SPARKP project measured a lifetime prevalence and this could have also resulted in different prevalence value.

Table 3 Summary of reviewed studies on food hypersensitivity

Country / Countries	Town/ Village/ Group	Date of publication	Author/s	Age / Age group (Years)	Prevalence (%)	Number of invited / eligible participants	Methodology	Measure of occurrence	Top four foods
Iceland, Turkey, UK, Norway, Poland, Sweden, Germany, Denmark, Finland, France.	-	2014	Nwaru et al.	< 18	5	-	Systemic review and meta-analysis of parent reported food allergy.	Point prevalence and life time prevalence of food allergy.	i. Cow's milk ii. Egg iii. Wheat iv. Soy
Finland	Tampere	2014	Jarvenpaa et al.	6-7	6.1 (to at least one food) 2.5 (to basic food)	1563	Parent-reported: school health information sheet and questionnaire.	Point prevalence of food allergy, coeliac disease, lactose intolerance.	i. Fruit and vegetables ii. Nuts iii. Eggs iv. Cow's milk
Italy	'Giocampus' Summer day camps	2011	Caffarelli et al.	5-10	9.9	900	Parent-reported through questionnaire.	Life time prevalence of food allergy.	i. Cow's milk ii. Eggs iii. Tomatoes iv. Peanut
Finland	Tampere	2011	Kallio et al.	6-7	9.2 (to at least one food) 2.7 (to basic food)	1542	Parent-reported: school health information sheet and questionnaire.	Point prevalence of food allergy, coeliac disease, lactose intolerance.	i. Fruit and vegetable ii. Nuts iii. Legumes iv. Eggs

Table 3 continued									
Country / Countries	**Town/ Village/ Group**	**Date of publication**	**Author/s**	**Age / Age group (Years)**	**Prevalence (%)**	**Number of invited / eligible participants**	**Methodology**	**Measure of occurrence**	**Top four foods**
Finland	Province of South Karelia	2009	Pyrhonen et al.	1-4	30	4779	Parent-reported through questionnaire and physician diagnosed.	Life time prevalence of perceived food hypersensitivity by parents, and food allergy diagnosed by a physician.	Essential food: i. Cow's milk ii. Eggs iii. Barley, Rye iv. Essential food: Other cereals (oat, maize, rice, millet, buckwheat) Non-essential food: i. Strawberries, Chocolate, Tomatoes ii. Citrus iii. Fish iv. Legumes: peanuts, peas, beans, soya, lentils.

Table 3 continued									
Country / Countries	**Town/ Village/ Group**	**Date of publication**	**Author/s**	**Age / Age group (Years)**	**Prevalence (%)**	**Number of invited / eligible participants**	**Methodology**	**Measure of occurrence**	**Top four foods**
America	National study	2009	Branum & Lukacs	0-17	3.9	-	Use of multiple United States national surveys collected by the National Center for Health Statistics.	Parent report point prevalence for food allergy.	i. Milk ii. Peanuts iii. Eggs iv. Shrimp
Isle of Wight- UK	National study	2008	Venter et al.	1- 3	33.7 (parent reported) 5-6 (food challenge and clinical history)	1063/969	Parent reported through questionnaire. Food challenge and clinical history.	Point prevalence.	i. Cow's milk ii. Egg iii. Peanut iv. Sesame
Austria, Belgium, Denmark, Finland, Germany, Greece, Italy, Poland, Slovenia and Switzerland. [REDALL Study]	European study	2007	Steinke et al.	4-6 < 18	4.2 4.7	1:5,000 of general population per country.	Parent reported through using questionnaires across the European Union.	Point prevalence of food allergy.	i. Cow's milk and milk products ii. Fruit iii. Hen's eggs iv. Vegetables

Table 3 continued									
Country / Countries	**Town/ Village/ Group**	**Date of publication**	**Author/s**	**Age / Age group (Years)**	**Prevalence (%)**	**Number of invited / eligible participants**	**Methodology**	**Measure of occurrence**	**Top four foods**
Italy [REDALL Study]	National Study	2007	Steinke et al.	< 18	3.9	1:5,000 of general population	Parent reported through questionnaire.	Point prevalence of food allergy.	i. Cow's milk & milk products ii. Fruit iii. Wheat, meat and meat products, eggs iv. Others
Greece [REDALL Study]	National Study	2007	Steinke et al.	< 18	4.8	1:5,000 of general population	Parent reported through questionnaire.	Point prevalence of food allergy.	i. Eggs & Others ii. Milk & milk products iii. Fruit iv. Meat & meat products
Isle of Wight-UK	Isle of Wight	2006	Venter et al.	6	11.8 (parent reported) 3.6 (sensitised) 2.5 (open food challenge and/or suggestive history)	1440	Parent reported through questionnaire. Physician diagnosed. Clinical diagnosis.	Parent reported point prevalence of food hypersensitivity. Sensitization Open food challenge &/or history & skin prick test.	i. Cow's milk ii. Milk products iii. Peanut iv. Wheat

Table 3 continued									
Country / Countries	**Town/ Village/ Group**	**Date of publication**	**Author/s**	**Age / Age group (Years)**	**Prevalence (%)**	**Number of invited / eligible participants**	**Methodology**	**Measure of occurrence**	**Top four foods**
Thailand	Bangkok	2005	Santadusit, Atthapaisalsarudee, & Vichyanond.	0.5-6	6.25	656	Parent reported through questionnaire.	Life time prevalence of adverse food reactions and food allergy.	In 3-6 year group: i. Sea food-shrimp ii. Cow's milk iii. Egg yolk, Other seafood iv. Egg white, junk food.
France	Toulouse	2005	Rance et al.	2-5 6-10	4 (2-5 years) 6.8 (6-10 years)	3500	Parent reported through questionnaire.	Point prevalence of a food allergy.	i. Cow's milk ii. Eggs iii. Kiwi iv. Peanuts
Denmark	Children born at Odense University hospital	2005	Osterballe et al.	> 3	1	301	Parent reported through questionnaires followed by clinical diagnosed.	Point prevalence of food hypersensitivity.	Older than 3 years: i.Fruit & vegetables ii. Cow's milk iii. Peanuts iv. Additives

Table 3 continued									
Country / Countries	**Town/ Village/ Group**	**Date of publication**	**Author/s**	**Age / Age group (Years)**	**Prevalence (%)**	**Number of invited / eligible participants**	**Methodology**	**Measure of occurrence**	**Top four foods**
Germany	Berlin	2004	Roehr et al.	≤ 17	38.4 (parent reported) 4.2 (clinically diagnosed)	4000	Parent reported through questionnaire followed by telephone interview. Clinical diagnosed.	Point prevalence of food hypersensitivity. Point prevalence of food allergy.	Parent reported: i. Acidic fruit ii. Vegetables iii .Other fruit iv.Nuts Clinically diagnosed: i. Apple ii.Hazelnut, soy, kiwi iii. Wheat iv. Carrot
France	Toulouse and Nancy	1999	Rance, Kanny, Dutau, & Moneret-Vautrin.	<15	N.A	544	Clinical diagnosis	No prevalence out of total population calculated.	3-6 year group: i. Peanuts ii. Eggs iii. Mustard iv. Cow's milk
Netherlands	National study	1998	Brugman et al.	4-15 4-6	7.2 7.6	4433	Parent reported through questionnaire.	Point prevalence of food hypersensitivity.	i. Food additives /preservatives ii. Chocolate iii. Other food. iv. Cow's milk.
Netherlands	Zuidholland-Zuid	1997	Aardoom et al.	5-6	3.8	2430	Parent reported through questionnaire.	Point prevalence	N.A
Netherlands	Rural area	1992	Van-Bockel Geelkerken & Meulmeester.	5-6	11.4	1039	Parent reported through questionnaires.	Life-time prevalence	Unknown.

Main food causing hypersensitivity

Cow's milk is the leading food causing hypersensitivity in the high majority of reviewed studies shown in Table 3. A marked difference is observed in now dated 1990's studies by Rance et al. in France, and Brugman et al. in the Netherlands, where cow's milk was the fourth food reported to cause hypersensitivity. A more recent 2005 study by Rance et al. in France, shows cow's milk at the top food inducing hypersensitivity, and this could be indicative of an evolving increased prevalence of milk hypersensitivity.

Germany is one of the countries in which milk is not blamed as one of the top four foods causing hypersensitivity. A 2003 study in Germany by Roehr et al. (2004) shows how following a telephone conversation for participants aged seventeen years or younger, acidic fruit, vegetables and other fruit were the top three food culprits. In a 2004 European project titled 'Reduced Allergenicity in Processed Foods'(REDALL), the German paediatric population aged younger than eighteen was also found to be mainly hypersensitive to fruit. A high prevalence of fruit induced hypersensitivity was also found in the REDALL study for Italy where fruit was considered as the second culprit for hypersensitivity in Italian children. This country follows a Mediterranean diet based on fruit and vegetables (Gelincik et al., 2008). Thus, such results indicate that the main food/s causing hypersensitivity can be a reflection of the country's specific staple food.

Two studies in Finland by Jarpenpaa et al. (2014) and Kallio et al. (2011) both indicate that fruit and vegetables were the top main cause of hypersensitivity in the town Tampere. Yet the Finnish study by Pyrhonen et al. (2009) in the other Finnish province South Karelian, reports how cow's milk was the main culprit causing hypersensitivity in children, with fruit and vegetables neither referred to as the top essential foods causing hypersensitivity nor as

the top non-essential foods. This confirms that results for a specific town or village should not be interpreted as a reflection of the whole country, as there can be intra-country differences.

Whilst a review by Kattan (2016) reports peanut allergy as one of the most common food triggering allergies in children worldwide, only one study in European countries ranks peanuts as the most allergenic food, where a 1999 study in France by Rance et al. reports that 3 to 6 year olds in the cohort were mainly hypersensitive to this food. Furthermore, only few of the reviewed research studies refer to peanuts as one of the top four foods causing hypersensitivity including another French study by Rance et al. (2005), the Italian study by Caffarelli et al. (2011), studies by Venter et al. on the Isle of Wight (Venter et al., 2006; Venter et al., 2008), and a study conducted in Denmark between 2001-2002 (Osterballe et al., 2005).

In their study on the prevalence of adverse food reactions and food allergy amongst Thai children, Santadusit et al. (2005) link the nil reporting of peanut hypersensitivity in their study to the culture in Thailand to introduce this food later in life, together with paucity in using peanut butter for children in Asia. In addition, peanuts in Asia are mainly boiled rather than roasted where the latter form of preparation is known to increase allerginicity (Beyer et al., 2001).

Tree nuts are considered the top food that causes fatal anaphylactic reactions worldwide (Crespo, James, Fernandez-Rodriguez, & Rodriguez, 2006). Yet, the only reviewed study that refers to nuts as one of the top foods causing hypersensitivity in Europe is that by Kallio et al. (2011) carried out in Finland, where 3.1% of the children at school entry were reported to have such hyperensitivity. When it comes to countries such as the United States, the 11- year follow up study by Sicherer et al. (2010) shows a significant increase in tree nut allergy with 1.1% of children younger than eighteen under study in 2008 found to be clinically allergic,

following 0.5% in 2002, and 0.2% in 1997. The variety in nut allergy frequency between Europe and other countries is likely linked to culinary traditions and cooking procedures, with genetics and time of first exposure to this food as putative influencing factors (Crespo et al., 2006).

Is food hypersensitivity treatable?

The standard mode of care for food hypersensitive patients to date is strict dietary avoidance of the food causing hypersensitivity (Scurlock, Burks, & Jones, 2009). Yet in the case of IgE-mediated food allergy, the more the allergen is avoided from the diet, the higher the risk of an allergic reaction over time (Toit et al., 2008). Once accidental cross contamination or ingestion is possible, in spite of strict restriction diets the risk of a severe or fatal reaction is always present (Scurlock et al., 2009).

In non-IgE-mediated allergy and non-allergic hypersensitivity, despite the effectiveness of exclusion diets, this restriction tends to lower the quality of life (Cummings, Knibb, King, & Lucas, 2010). Hence alternative treatment options for hypersensitivity are on demand and at different level of testing.

<u>Immunotherapy</u>

Sublingual Immunotherapy (SLIT) and Oral Immunotherapy (OIT) are amongst the immunotherapy procedures aimed to treat IgE-mediated allergies by inducing desensitisation and putative tolerance to an allergenic food (Scurlock et al., 2009). During SLIT a liquid extract of the food is administered under the patient's tongue, whilst during OIT protein powder from

the allergenic food is mixed with palatable food and consumed orally (Scurlock et al., 2009). During both immunotherapy processes the procedure starts off with small doses of the antigen with increase in dose over a period of time. Forefront phase 1 and 2 randomised controlled trials for desensitisation of peanut allergy in children by Anagnostou et al. (2014) show how following an oral immunotherapy protocol at Cambridge University hospital UK, 84% of participants in the first phase and 91% in the second phase were desensitised for an ingestion of 800mg daily, equivalent to five peanuts. Desensitisation refers to the ingestion of a higher dose of antigen from the time of allergic reaction, which can be maintained by ongoing periodic consumption of the food allergen (Scurlock et al., 2009). Yet what the 2014 Cambridge research did not study was if OIT can lead to tolerance, which is the body's ability to suppress an immune response to any level of an antigen which previously triggered an immune response (Faria & Weiner, 2005). A study by Blumchen et al. (2010) on oral peanut immunotherapy in children with peanut anaphylaxis shows how desensitisation is lost after a median of nine months from when OIT is stopped. Hence it is likely that long term periodic antigen ingestion is required to reach tolerance (Jones et al., 2009).

Clinical trials for immunotherapy have so far been carried out on a limited number of foods, and so more research in this field is required to confirm if this therapy is feasible and successful with all food.

As an alternative to immunotherapy, immunization studies with mutated engineered peanut protein allergens have shown to be promising in murine models. Li et al. (2003a) and Li et al. (2003b) show how after 10 weeks of receiving recombinant proteins for peanut, during a peanut food challenge the risk of anaphylactic symptoms was reduced.

Research by Pagovich et al. (2016) has shown how a single administration of an adeno-associated virus gene transfer vector coding for anti-human immunoglobulin type E can protect against repeated peanut allergy manifestation on exposure in mice. Should this murine model translate in humans, it could be a one-time preventative therapy for peanut and other IgE-mediated food allergies.

Immunotherapy has also been researched for non-IgE-mediated food hypersensitivity. This is the case for coeliac disease where cytokine interleukin-15 (IL-15) neutralising agent has shown potential as a therapeutic aid (Setty et al., 2008). In fact, clinical trials using humanised anti-interleukin-15 antibody (HuMax-IL-15), interleukin-15/Fc chimemeric protein (CRB-15) and monoclonal antibody Mikβ1 show hope for patients with coeliac disease. (Bayry et al., 2007); Ferrari-Lacraz et al., 2004).

Enzyme replacement therapy

When the food hypersensitivity is the result of the body's inability to produce digestive enzymes, enzymes replacement therapy is available (Felicilda-Reynaldo & Kenneally, 2016). Pancreatic enzymes amylase, protease and lipase are available as pharmacological therapy (Al-Kaade, 2014). Lactase enzyme supplements can also be consumed for lactose intolerance when the patient does not choose to follow a completely lactose free diet (Di Rienzo et al., 2013; Savaiano, 2014).

Khosla, Gray, & Sollid (2005) have studied the putative efficacy and dosage of prolyl endopeptidase in the digestion and detoxification of gliadin peptides. Studies using these enzymes have shown that such peptidases could offer treatment for coeliac disease.

Other therapies

Use of probiotics is another pharmacologic approach for the treatment of various food hypersensitivities. A 2015 study by Shandilya, Sharma, Kapila, and Kansal has shown how administration of a probiotic containing *Lactobacillus acidophilus* and *Bifidobacterium bifidum* has halted the elevation of whey proteins-specific serum IgE production in a murine model. These results indicate that a probiotic containing the bacteria under study, could possibly be used as a therapeutic agent in IgE-mediated food allergy.

Probiotics are also used to treat lactose hypersensitivity, where the microorganisms present contain beta-galactosidase or lactase which aid lactose breakdown (Usai-Satta, Scarpa, Oppia, & Cabras, 2012).

Other therapies for IgE-mediated food allergies in various stages of development include Chinese herbal therapy, cytokine-specific therapy and monoclonal IgE antibody therapy (Scurlock et al., 2009).

With reference to coeliac disease, zonulin inhibitor larazotide is being viewed as an intestinal barrier corrector, with double-blind randomised, placebo-controlled human clinical trials showing it is safe, well tolerated and efficient (Paterson, Lammers, Arrieta, Fasano, & Meddings, 2007).

Conclusion

In conclusion, the reported prevalence of food hypersensitivity worldwide for the paediatric population to date in the 21st century ranges from 1% in the Denmark to 38.4% in Germany (Osterballe et al., 2005; Roehr et al., 2004). With regards to available research on food hypersensitivity for the 4-to 6-yr-olds, parent reported prevalence ranges from 4.2 to 11.8% (Steinke et al., 2007; Venter et al., 2006), with the value going down to 2.5% when including research that reports a point prevalence based on food challenge and/or suggestive history and skin tests (Venter et al., 2006).

Such a vast range of values is the result of various combinations including the type of hypersensitivity being measured, the age group under study, the country and/or town, and whether point or lifetime prevalence is measured.

Inconsequential to the prevalence of food hypersensitivity in a country, the quality of life of children with a perceived heightened reaction to food, and that of their families/guardians who prepare the food and live them, is lowered (Cummings et al., 2010). Hence heightened education to the general public on the putative underlying causes of the various forms of food-induced hypersensitivity could prevent an increase in prevalence where conceivable.

In addition, accurate diagnosis and classification of food induced hypersensitivity is vital not only to prevent reactions which at times can be life-threatening, but also to prevent unnecessary dietary restrictions, avoidable anxiety and lowered quality of life should a hypersensitivity not be truly present (Kattan & Wang, 2013; Fleischer, 2015).

The advancement in therapies for both allergic and non-allergic food hypersensitivity will also likely demonstrate to improve the quality of life of individuals with food hypersensitivity and their families.

In the meantime, the child with a food hypersensitivity together with all entities responsible for a child's eating setting including families, schools, restaurants, caterers and the food industry, should be well educated on the different forms of food-induced hypersensitivity, their risk and how to prevent them. This is imperative in providing children with food hypersensitivity a healthy and safe environment. This can lead to the question of whether in countries where food hypersensitivity has not been studied yet such as Malta, children's environment is a safe one. Hence would forefront research on the prevalence of food hypersensitivity in Malta create more awareness on the topic and increase safety for children with food-induced hypersensitivity?

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The prevalence of parent reported food hypersensitivity at school entry in Malta.

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This research is dedicated to Matthias and Mattea for being the inspiration behind my studies and this research. – Mum.

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Title: The prevalence of parent reported food hypersensitivity at school entry in Malta

Proposed chosen journal appropriate to publication of paper: Malta Medical Journal

The chosen journal is published by the University of Malta Medical School, with the aim of publishing papers on various health and medical aspects including nutrition.

To date no research has been conducted on food hypersensitivity in Malta. This study is at the forefront to share information on food hypersensitivity with Maltese health professionals, educators and the general public. This fulfils the aim of heightening local awareness on allergic and non-allergic food hypersensitivity, and consequently action could be taken at clinical and educational level to provide the necessary multidisciplinary service required by patients with food induced hypersensitivity.

This research has been presented at the 9th edition of the Malta Medical School Conference on the 4th of December 2015 through a poster presentation and oral power point presentation.

The Malta Medical School Conference is an event carried out triennially which showcases Medical and Scientific research carried out in Malta or abroad. This event provides an opportunity for scientific networking, inter-professional and business relationships, together with communication with conference sponsors. Oral and poster presentation are presented on a spectrum of specialities, while guest speakers deliver sessions on innovations in the medical and scientific field.

The Prevalence of Parent Reported Food Hypersensitivity at School Entry in Malta

M. M. Porter Abdilla & S. J. Fallows

Introduction

Main foods causing FHS

The prevalence of allergic and non-allergic food hypersensitivity (intolerance) or aversion to food in Malta has not been previously reported. This research provides local statistics on food hypersensitivity (FHS) in the paediatric population.

The main food causing hypersensitivity in the population under study has been identified, and prevalence in Malta is compared with other countries.

Method

Between January and March 2015, every school in Malta which includes Year 1 children aged 5-to-6years (N=83 schools), was invited to participate in this research study.

The participant schools were then provided with a questionnaire to be distributed to those parents who had previously reported FHS through the health information sheet, as shown in Figure 1.

Figure 1. Study flow chart

Results

The point prevalence for food hypersensitivity in the 5-to-6 year old participant population in the study was found to be 2.5%. Of the foods causing hypersensitivity in the studied group, milk and milk products were the main causes, affecting 14 (38.9%) and 30.6% (11) of participant children respectively, followed by tree nuts affecting 8 (22.2%) as shown in Figure 2.

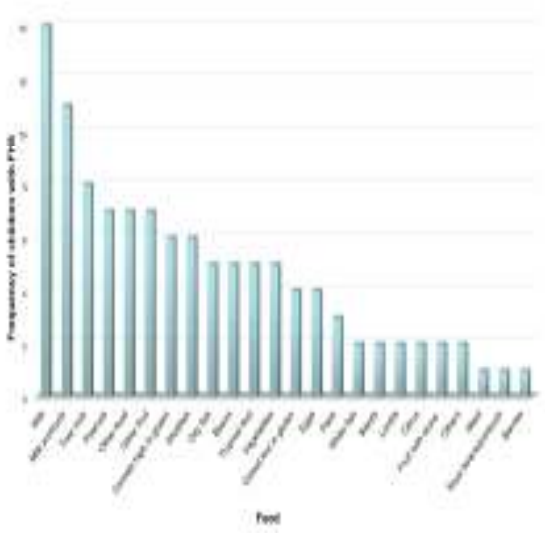

Figure 2. Frequency of food causing hypersensitivity in 5-to 6-yr-old Maltese children

Conclusion

The 2.5% point prevalence of Year 1 children with FHS in Malta is comparable with those in other European countries (Steinke et al., 2007), whilst lower than the wider international levels where 5 to 8% rate for both point and life-time prevalence of FHS is reported. Such a local prevalence shows the level of need for action on allergic and non-allergic food hypersensitivity in Malta. This includes the need for school policy guidelines on FHS. Such local statistics also indicate that the Health Department needs to have a course of action in this field. This could possibly include the set-up of a state clinic that holistically assists all patients with heightened reaction to food.

Epipens® worn by children with FHS

References:

Jackson, W.F. (2003) *Food Allergy*. Brussels, Belgium: International Life Sciences Institute

Johansson, S.G., Bieber, T., Dahl, R., Friedmann, P.S., Lanier, B.Q., Lockey, R.F., ... Williams, H.C. (2004). Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization. *Journal of Allergy and Clinical Immunology*, 113, 832-6.

Steinke, M., Fiocchi, A., Kirchdorfer, V., Ballmer-Weber, B., Brockow, K., ... Wüst, R. (2007). Perceived Food Allergy in children in 10 European Nations. *Journal of Allergy and Immunology*, 143, 291-295.

Acknowledgements:

Part of MSc Human Nutrition at the Department of Clinical Sciences & Nutrition University of Chester.

Abstract

Author: Maria Mariella Porter Abdilla

Introduction

This research aimed to provide local statistics in the area of food hypersensitivity in the paediatric population, as the prevalence of such allergic and non-allergic food hypersensitivity (intolerance) to food in Malta at the present time is previously undocumented. The main food which causes hypersensitivity in the population under study has been identified and compared to the main causes of hypersensitivity in other countries.

Method

Between January and March 2015, every school in Malta which includes Year 1 children (5-to 6-yr-olds) (N=83 schools) was invited to participate in this research study.
Participant schools (n=42) were then provided with a questionnaire to be distributed to those parents who had previously reported food related hypersensitivity to the school through the health information sheet.

Results

The point prevalence for food hypersensitivity in the 5-to 6-yr-old participant population in the study was found to be 2.5%. Of the foods causing hypersensitivity in the studied group, milk and milk products were the main causes, affecting 38.9% and 30.6% of participant children respectively, followed by tree nuts (22.2%).

Conclusion

The 2.5% point prevalence of Year 1 5-to 6-yr old children with food hypersensitivity, indicates the level of action required on allergic and non-allergic food hypersensitivity in Malta. This includes the need for school policy guidelines on food hypersensitivity. Such local statistics also indicate that the Health Department needs to direct attention to this field. This could possibly include the set-up of a state clinic that holistically assists all patients with heightened reaction to food.

Introduction

According to the nomenclature by the European Academy of Allergy and Clinical Immunology Task Force the term food hypersensitivity is the general term used to refer to any adverse reaction to food (Johansson et al., 2001). This can be further classified into allergy and non-allergic food hypersensitivity (Skypala & Venter, 2009), with Madsen (2005) including even food aversion. The term 'food hypersensitivity' has been used in this study in order to incorporate all reactions to food and to prevent having the participants misdiagnose non-allergic food hypersensitivity or aversion with the much misused term 'food allergy'.

Review of studies carried out in the 21st century shows how the reported prevalence of food induced hypersensitivity ranges from 1% in Denmark (Osterballe, Hansen, Mortz, Host, & Bindslev-Jensen, 2005), to 38.4% in Germany (Roehr et al., 2004). Yet prevalence can vary depending on various factors in the study, including the age bracket, methodology, food items considered, the country where the study is being conducted, and whether lifetime or point prevalence is studied (Jackson, 2003).

Another influencing factor is the nomenclature used by various studies in this field. Whilst terms like 'allergy', 'perceived allergy' or 'food hypersensitivity' have a specific scientific definition, the general public often fails to distinguish between these terms (Gupta et al., 2013).

A study conducted by Steinke et al. (2007) on perceived food hypersensitivity in ten European nations, showed how the 4-to 6-yr-old paediatric population under study had a point prevalence of 4.2%. In this study milk was the most reported food causing hypersensitivity (38.5%). When looking at the participating Mediterranean countries, 4.8% of Greeks and 3.9% of Italian participants younger than 18 years, reported some form of reaction to food. In Italy,

milk was the highest cause of food hypersensitivity (33.3%) whilst in Greece eggs and 'other food' were the main culprits each at 27.1%. Food hypersensitivity to seafood and wheat were shown to be absent in the Greek participants, whilst in Italy food hypersensitivity to legumes was absent.

There have been no previous studies neither about the prevalence of food hypersensitivity in the Mediterranean island of Malta, nor on the foods that cause such reactions locally. This research aims to provide forefront local statistics in the area of food hypersensitivity in the paediatric population by analysing the age group 5-to 6-year olds at compulsory school entry. The food which is mainly causing hypersensitivity locally is analysed through this study and compared to the main causes of food induced hypersensitivities in other countries.

Methods

Participant schools, students and parents

Following approval by the Research Ethics Committee of Life Sciences at the University of Chester (reference 981/14/MP/CSN) (Appendices A & B), Research and Development department at the Ministry of Education and Employment in Malta (Appendix C), and Secretariat for Maltese Catholic Education (Appendix D) to carry out research in Maltese schools, between January and March 2015, every school in Malta which includes children aged 5-to 6 years (*N*=83) was invited to participate in this research study. Each school was provided with an electronic letter of invitation (Appendix E), together with a participant school information sheet (Appendix F). This included all state (n=50), church (n=22) and independent schools (n=11) on the island. The Heads of Schools who decided to participate in the study were asked to sign a school participation consent form (Appendix G) and provide

the number of Year (Grade) 1 students or equivalent (aged 5-to 6years), who have reported food hypersensitivity on the Health information sheet provided by the school at the beginning of the scholastic year. In Maltese schools it is mandatory to have this sheet filled in and returned by every child's parent/guardian.

The participant schools were then provided with letters of invitation (Appendix H), participant parent information sheets (Appendix I) and questionnaires (Appendix J) to be distributed to the parents who had reported food hypersensitivity.

The parents were given a week to return the questionnaire to the respective school after which the questionnaires were collected by the researcher. In the case of unreturned questionnaires, the schools were encouraged to contact the parents and extend the period provided for the questionnaires to be filled in. Figure 1 shows a flow chart for the methodology followed in this study.

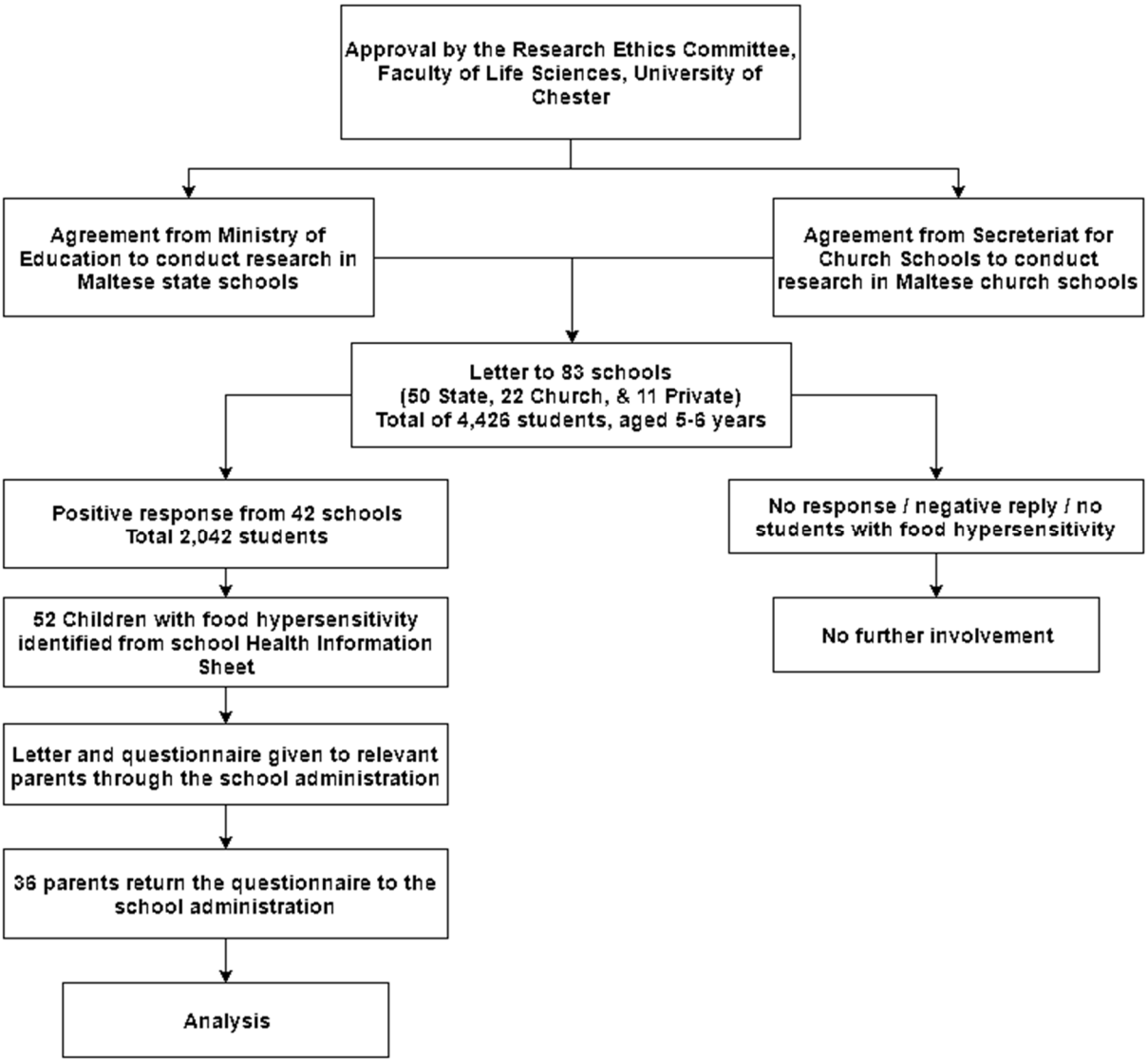

*Figure 1***.** Study flow chart.

Study design

The questionnaire used for this study was validated by using past research on parent reported food induced hypersensitivity. This included research on six year old children on the Isle of Wight by Venter et al. (2006), two studies involving Finnish children at school entry (Jarpenpaa et al., 2014; Kallio, Salmivesi, Kainulainen, Paassilta, & Korppi, 2011), together with the study by Pyrhonen, Nayha, Kaila, Hiltunen, and Laara (2009) involving Finnish children aged 1 to 4 years.

In Malta most people speak both Maltese and English fluently. Yet, in the situation where a minority of the population understands either one language or the other, all communication with parents including the questionnaires, was provided in both languages. This should have increased the rate of questionnaire content understanding, where parents also had the possibility to shift language as deemed necessary.

The questionnaire included a wide choice of food which the parents had to mark according to their child's hypersensitivity. The parents were also asked how much of the food could be tolerated before a reaction is observed and the severity of the reaction observed. In order to obtain a clear picture of how food hypersensitivity is being treated locally, the parents were also asked about which health professional has been approached, if an action plan has been provided, if the hypersensitivity has been tested, and if any medications have been prescribed. The possible rate of hypersensitivity heredity was obtained by asking if there were other family members who had the same or any other form of heightened reaction to food. Finally, parents were also asked if the child has ever shown hypersensitivity to other non-food items.

Data analysis

All questionnaire data was entered into SPSS Version 22, where percentages were used to calculate the overall prevalence of food hypersensitivity in Malta, whilst frequencies were used to calculate the number of children showing hypersensitivity to each questioned food.

Results

All the schools in Malta were invited to participate in this research with a total of 4,426 5-to 6-yr-olds in Year 1 for scholastic year 2014-15. This included a total of 2,274 boys (51.4%) and 2,152 girls (48.6%) eligible for this study. A total of 42 schools (50.6%) accepted to participate. This included 48% of the state, 59% of church and 45.5% of private schools. The cohort of students from participant schools was 2,042 tallying to 46.1% of the total Year 1 population in Malta for the scholastic year under study. School administration from the participating schools reported a total of 52 food hypersensitivity cases. This indicates a 2.5% point prevalence for food hypersensitivity in the 5-to 6-yr-old population. Out of the 52 cases, 36 (69%) questionnaires were completed and returned by the parents. The sample of reported students with food hypersensitivity included 21 (58.3%) boys and 15 (41.7%) girls.

When it comes to the main food causing hypersensitivity in the 5-to 6-yr-old sample, milk and milk products were the main causes, affecting 14 (38.9%) and 11 (30.6%) participants respectively, followed by tree nuts affecting 8(22.2%). Peanuts, other fruit and the 'other food' category all showed a prevalence of 19.4%. The prevalence of food hypersensitivity for the various food included in this study is shown in Figure 2.

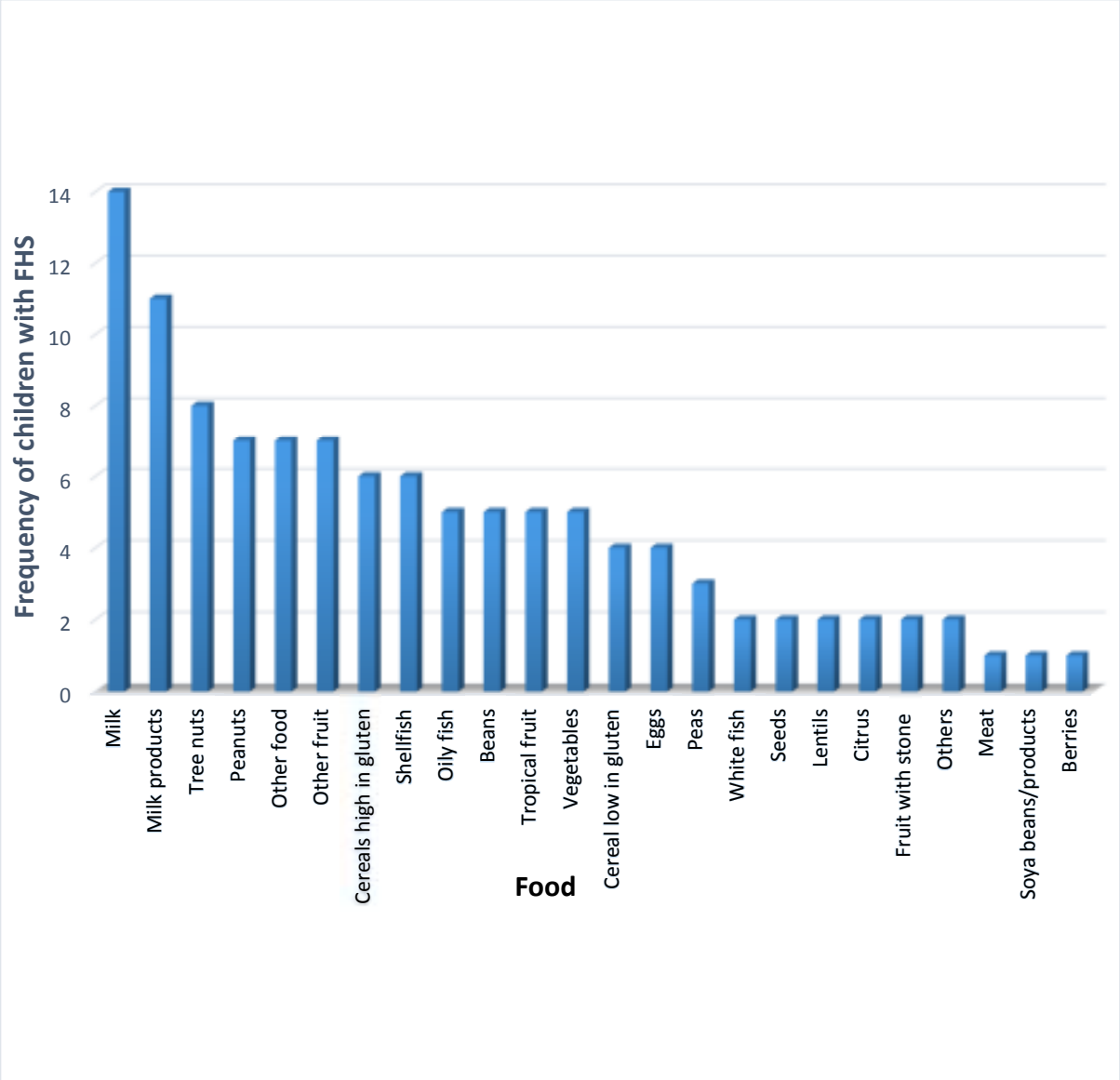

Figure 2. Frequency of food causing hypersensitivity in the 5-to 6-yr-old group.

When asked how much of the food causing hypersensitivity can the child tolerate before a reaction is observed it resulted that 20 (55.6%) of the students could not have any of the food causing hypersensitivity. The frequency of students showing varying levels of food tolerance is shown in Table 1.

Table 1 Frequency and percentage of students showing varying levels of tolerance to the food they are hypersensitive to.

Level of tolerance	Frequency of children	Percentage of children (%)
Varying amounts	8	22.2
Hypersensitivity onset with increased intake	10	27.8
Cannot have any	20	55.6
Unsure	9	25
Reaction increases with raw state	1	2.8

Note: Percentage values do not add up to 100% due to the possibility to choose multiple responses from the questionnaire.

In order to obtain feedback on the level of reaction these children have to the hypersensitivity causing food, the parents were asked to mark the reactions observed when the child was exposed to the food. Table 2 shows the frequency of children showing different levels of reaction when exposed to the food causing hypersensitivity.

This study also investigated which health professional the parents are referring to in the case of a food hypersensitivity. Results show a high proportion (68.6%) of parents referring to a paediatrician, followed by an allergy specialist (36.1%) and a family doctor (34.3%) with some participants referring to more than one health professional. The majority of children 24 (66.7%) had their hypersensitivity tested for, out of which 22 (91.7%) had tests done at the main state hospital and two (8.3%) at private clinics.

Table 2 Frequency and percentage of children showing different levels of reaction when exposed to the food causing hypersensitivity.

Level of reaction to food	Number of children	Percentage of children (%)
Swollen lips, face, eyes	10	27.8
Itchy or tingling mouth	6	16.7
Hives (allergic urticaria) or Itchy skin rash	9	25
Eyes symptoms	1	2.8
Atopic rash or worsening of atopic skin (infantile/atopic eczema)	11	30.6
Itching in the outer ear	1	2.8
Anal rash or itching	5	13.9
Hoarse voice, difficulty swallowing, swollen tongue	4	11.1
Difficult or noisy breathing, wheeze or persistent cough	7	19.4
Nausea or vomiting	10	27.8
Diarrhoea	6	16.7
Persistent dizziness / pale or floppy	3	8.3
Suddenly sleepy or collapse	6	16.7
Unconscious	1	2.8
Tummy Ache	1	2.8
Other swollen body parts	1	2.8

Note: Percentage values do not add up to 100% due to the possibility to choose multiple responses from the questionnaire.

When asked if any medication has been prescribed for the food hypersensitivity, 15 (41.7%) of participants stated that the reaction to food is being medically treated. Table 3 shows the prevalence of children taking medication to treat their food hypersensitivity.

Table 3 Frequency and percentage of students who were provided medication in relation to their food hypersensitivity.

Medication	None	Antihistamines	Steroids	Inhaler	Auto-injector	Other
Frequency	21	9	8	3	2	1
Percentage (%)	58.3	25	22.2	8.3	5.6	2.8

Note: Percentage values do not add up to 100% due to the possibility to choose multiple responses from the questionnaire.

When asked if the child in question ever showed signs of heighted reaction to other substances, 9 (25%) participants confirmed such a reaction. The highest number of children were found to react to non-food items from the 'other' section as shown in Table 4, where soaps, other medicines and mosquito bites were the main culprits.

Table 4 Frequency and percentage of children showing hypersensitivity to other substances.

Reaction to non-food items	Other	Painkillers	Antibiotics	Skin creams
Frequency	5	4	3	3
Percentage (%)	13.9	11.1	8.3	8.3

Note: Percentage values do not add up to 100% due to the possibility to choose multiple responses from the questionnaire.

When participants were asked if their child ever showed hypersensitive reactions in the absence of food, 23 (63.9%) agreed. Table 5 shows the frequency and percentage of children in the study showing non-food related hypersensitive reactions.

Table 5 Frequency of children showing hypersensitive reactions not related to food.

Frequency of children showing hypersensitive reactions in the absence of food.	**Frequency of children**	**Percentage of children (%)**
Asthma	8	22.2
Allergic inflammation of the eyes	2	5.6
Atopic rash / atopic eczema	13	36.1
Coughing for more than a month without flu	7	19.4
Hay fever / pollen allergy	11	30.6
Hives (allergic urticaria) Itchy skin rash	5	13.9
Hypersensitivity to any animal fur	7	19.4
Wheezing	10	27.8

Note: Percentage values do not add up to 100% due to the possibility to choose multiple responses from the questionnaire.

When asked if there were any other family members who have the same food hypersensitivity, 13 (36.1%) answered in the affirmative. The highest prevalence was shown in siblings, where seven (19.4%) of the cases had the same hypersensitivity, followed by six (16.7%) of the cases referring to the mother. When participants were asked for other family members showing some form of heightened reaction to food not necessarily like that of the child, the frequency went up to 26 (72.2%), where the mother was the family member most likely to have a food hypersensitivity showing in ten (27.8%) cases, followed by siblings and the father in nine cases (25%) respectively.

Discussion

The 2.5 % point prevalence of food hypersensitivity at school entry in Malta has been found to be equivalent to the prevalence in a study by Venter et al. (2006) on the Isle of Wight, following food challenge and/or suggestive history. These two studies have various similarities in that both include a study on an island, both research the prevalence at school entry where the target population was approached via schools, and all the schools on each island were invited to participate. Yet whilst the research by Venter et al. (2006) has given out a questionnaire to all the parents of 6 year olds eligible during the year of study, this research has obtained information about the number of food hypersensitivity cases through school administration followed by questionnaire administration to those parents reporting hypersensitivity. In fact, analysis of questionnaires by Venter et al. (2006) has shown an 11.8% perceived prevalence, which is higher than the 3.6% reported in the same study upon sensitisation, and 2.5% on combination of open food challenge and/or suggestive history.

Hence the methodology followed in the research conducted in Malta could have led to a more factual prevalence of hypersensitivity on the island, by leaving out most of the perceived cases that have been outgrown and those which are more likely the result of food aversion.

Other studies with similar prevalence include those in Tampere, Finland by Jarpenpaa et al. (2014) and Kallio et al. (2011), where a parent reported point prevalence of food hypersensitivity to basic food of 2.5% and 2.7% were reported respectively. Like the Maltese study, these researches were also carried out on first graders. Yet whilst in Malta school is obligatory at the age of 5 to 6 years, in Finland children start school at 6 to 7 years.

There is also similarity in the methodology used between the Tampere studies and that held in Malta, where following analysis of health information sheets, questionnaires were handed out only to parents reporting a perceived hypersensitivity.

Yet these Finnish studies were showing a prevalence for basic food allergies, coeliac disease and lactose intolerance and do not incorporate other forms of food hypersensitivity. In addition, these studies were conducted in the town of Tampere and results are not directly a reflection of the whole country.

From the above, it can be concluded that the point prevalence of parent reported food hypersensitivity at school entry in Malta is comparable with that in Tampere, Finland for same scholastic year (Jarpenpaa et al., 2014; Kallio et al., 2011), and with the point prevalence for the same age group on the Isle of Wight based on open food challenge and/or suggestive history (Venter et al., 2006).

The age group chosen for this study could have also had an effect on the resulting prevalence, and hence a different prevalence is observed when comparing to other research on paediatric food hypersensitivity. At 5 to 6 years most children would have been exposed to most food, and the likelihood of a true hypersensitivity would have been discovered. The introduction of higher ages in the cohort would increase the chance of having parents reporting a heightened reaction that was diagnosed at an earlier stage, has perhaps been outgrown, but not been retested for. Likewise, the inclusion of lower ages in the cohort would likely inflate the prevalence of reported hypersensitivity due to children's immune system still developing (Venter et al., 2008).

Whilst the prevalence in this study focused on a specific age group, the putative low food hypersensitivity prevalence in Malta is worth speculating. As an island in the middle of the

Mediterranean where locals traditionally follow a Mediterranean diet, this diet could be offering protection against hypersensitivity as hypothesised in a cross-sectional epidemiological study involving fifteen countries by Woods, Abramson, Bailey & Walters (2000). Yet with the added incorporation of a vast majority of international foods in the Maltese diet, the protective effect of the Mediterranean diet in Malta could still be questioned.

Some studies indicate that breastfeeding has a protective effect against food induced hypersensitivity (Ronald & Kleinman, 2014). Yet such a protective effect is unlikely the cause of a lower hypersensitivity prevalence shown in this study, when Malta has a low breastfeeding rate when compared to other European countries (Parliamentary Secretariat for Health, 2014). In 2012 it has been reported that only 71% of mothers were breastfeeding at hospital discharge following birth (Parliamentary Secretariat for Health, 2014).

A high rate of antibiotic use especially in the early years is hypothetically linked to intestinal permeability and increased risk of immune-hypersensitivity disorders (O'Hara & Sanahan, 2006) including food allergies. With Malta being a country with the highest use of antibiotics in Europe (Eurobarometer, 2013), such a high national consumption is contradictory with the low reported prevalence of food hypersensitivity. In a 2002 survey, 55% of Maltese reported use of antibiotics in the previous twelve months (Eurobarometer, 2013).

A hypothetical protective factor for a low rate of hypersensitivity in Malta could be the early introduction of certain food during weaning. A Maltese research by Buttigieg, Townsend-Rocchiccioli and Ellul (2012) on maternal awareness of health promotion in preschool children, has revealed early introduction of food, with soluble biscuits mixed with artificial milk introduced from the second month after birth, cereals from a modal age of three months

and vegetables at four months. In fact, a study by Toit et al. (2008) has shown how the rate of peanut allergy in Jewish 4-to 12-yr-olds living in Israel and consuming peanut through traditional snacks from the first weaning months is 0.12%, compared to 2.05% for Jewish children in the same age group living in London and exposed to peanuts at a later age.

Another hypothetical protective factor is genetics. Since Malta is an island the rate of immigration could be relatively low, resulting in a lower rate of introduction of genes from other populations possibly responsible for food induced hypersensitivity (Hong, Tsai, & Wang, 2009). Hence whilst the Maltese paediatric population could be already exposed to environmental factors known for triggering food hypersensitivity, genetic susceptibility (Arrieta, Bistritz, & Meddings, 2006) together with the traditional early introduction of basic food (Buttigieg et al., 2012) could be putative causes for the lower rate of hypersensitivity on the island when compared to international levels.

When it comes to the main food that causes hypersensitivity, similarly to most other European and non-European countries, cow's milk followed by milk products, were found to be the main cause of hypersensitivity in Malta. Yet when it comes to the Mediterranean country Greece, eggs and 'other food' category were the main foods causing hypersensitivity in a 2007 study by Steinke et al. In Italy research by Caffarelli et al. (2011) shows eggs as the second most prevalent food causing hypersensitivity whilst in Malta eggs were reported as the seventh food causing heightened reaction. Another noticeable difference between Malta and other Mediterranean countries is the prevalence of hypersensitivity to fruit. Whilst the study in Europe by Steinke et al. (2007) demonstrated fruit to be one of the top foods causing hypersensitivity, in Malta citrus, fruit with stones and berries were ranked low. Fruit from the 'other fruit' category was ranked fourth equivalent to peanuts and 'other food'. The low

prevalence of hypersensitivity to eggs and the majority of fruit in the Maltese age group under study could possibly be linked to the early weaning practices in Malta (Buttigieg et al., 2012).

Tree nuts and peanuts were reported by this study to be the third and fourth food causing hypersensitivity respectively. Their level as hypersensitivity causing food is higher than that resulting from studies in Europe by Nwaru et al. (2014) and Steinke et al. (2007), where neither tree nuts nor peanuts were amongst the top four foods causing hypersensitivity. Tree nuts have been part of this country's culinary culture for years, where these are used for most cultural and family celebrations. Hence a rather high prevalence of reported hypersensitivity to nuts in a scenario where such food has been used in the country for years is puzzling. What could be the cause of such a high prevalence is the increased promoted use of nuts in the main dishes which, together with the traditional amounts used, could be exposing children to a higher level of nuts.

With regards to peanuts, it is part of the Maltese culture to serve peanuts with shell following traditional meals. Yet the recent introduction of peanut butter from early years in the paediatric population diet, could be changing exposure to this legume and resulting in heightened sensitivity as hypothesised in studies on peanut allergy in America (Sicherer, Munoz-Furlong, Godbold, & Sampson, 2010).

Based on the hypothesis that early introduction of food allergens lowers the risk of food allergy, since the Maltese study by Buttigieg et al. (2012) does not refer to peanuts and nuts as food groups introduced before 12 months, the late introduction of such food in Maltese children's diet could also be another factor for peanuts and nuts to be reported as top foods causing hypersensitivity.

When asked how much food the child can tolerate before a reaction is observed, 20 (55.6%) participants in this study stated that the child cannot have any of the food causing hypersensitivity. This could be the result of a severe allergic reaction nature or due to strict adherence to the elimination of the culprit food. Such a prevalence of food elimination together with all participants indicating some form of mild-to moderate to severe reaction when consuming the food, and 41.7% having medication prescribed for their allergy, further indicates how Maltese schools should be equipped with the necessary guidelines to deal with all forms of food induced hypersensitivity. To date such policies are absent.

In addition, there were 23 (63.9%) of the children having a food induced hypersensitivity also indicating other reactions including asthma, hay fever and wheezing. This is in line with the hypothesis that there is a link between food hypersensitivity and atopy (Sampson, 2004). Research by Montefort, Ellul, Montefort, Caruana, & Agius Muscat (2009) has shown an increasing prevalence of asthma and allergic rhinitis amongst 5-to 8-yr-olds in Malta.

With 68.6% of respondents stating that the food induced hypersensitivity was discussed mainly with their paediatrician reflects the practice in Malta where parents can discuss health related issues with their private paediatrician. Currently in Malta there are no food allergists at the main state hospital, with an allergy clinic for paediatric patients only functioning few hours weekly. Hence the 36.1% of participants stating that they were seen by an allergy specialist highly likely indicated attendance at this clinic. In Malta, other paediatric non-allergic hypersensitivity, food aversions and all cases of adult hypersensitivity are treated by different health professionals ranging from family doctors to gastro-enterologists. Various European countries have invested in structured food hypersensitivity clinics (Steinke et al.,

2007). Keeping into perspective the small Maltese population and size of this island, it can be stated that Malta is in need of at least one main clinic specialising in food hypersensitivity.

With reference to family members who have some form of hypersensitivity, the high reported prevalence in this study is indicative of a hereditary factor (Hong et al., 2009). In Malta this could be highly likely due to the small size of the island and the small gene pool.

Limitations of study

Since questionnaires were distributed only to the parents who had previously reported some form of hypersensitivity to the school, the main limitation in this study was that there were only unreturned questionnaires from the food hypersensitive population, making the sample even smaller for questionnaire related analysis. Yet this methodology had no influence on the prevalence of reported hypersensitivity cases.

This study also could not classify the participants into those with food allergies, non-allergic food hypersensitivity or food aversion. A thorough way of further identifying if the food hypersensitivity has an allergic nature or not, serum Ig E tests and skin prick tests, followed by the gold standard double-blind placebo-controlled food challenge is required (Gelincik et al., 2008).

Due to the relatively small sample of children with reported food hypersensitivity to schools, it was inappropriate to calculate if there was a significant difference between gender hypersensitivity to food.

Recommendations for future research

It would be appropriate to have this study repeated with the same group of students and find what happens to the prevalence of food hypersensitivity over time. A prospective study on 5- to 6 year olds attending Year 1, could also indicate possible changes in food induced hypersensitivity prevalence.

Having a study which incorporates more school years, or possibly a national study including various age groups would also provide a clearer picture about the hypersensitivity prevalence in Malta. Further, state funded clinical studies which are able to provide the prevalence of diagnosed allergic and non-allergic food hypersensitivity in Malta can provide a clinical analysis of hypersensitivity in this country.

Whilst research in therapy that assists patients outgrow their food hypersensitivity is advancing, it would be beneficial to have local research in this field. This could include work on oral immunotherapy case studies followed by protocols which assist patients with allergies to outgrow their hypersensitivity.

Conclusion

What makes this study unique in the field of food hypersensitivity is the small size of the island Malta, where all the schools in this country were invited to participate. In addition, half the schools in Malta have participated in this study and they were evenly distributed around the island. Besides, the number of invited participants and the cohort participating in the Maltese study are amongst the highest when compared to all reviewed research on prevalence of reported food hypersensitivity in the paediatric population. In addition, the prevalence for parent reported hypersensitivity was based on communication with school administration about the reported cases on the health information sheet rather than on returned questionnaires. Hence it can be stated that the prevalence reported is a realistic outcome of the national food hypersensitivity prevalence in the age group studied.

The majority of participants in this study (61.1%) stated that the food hypersensitivity was tested at the state hospital. This further shows the importance of this study at finding the prevalence of food hypersensitivity in this country. This indicative prevalence can be used by the Health Department in Malta to predict the likely expense to test for such food induced hypersensitivity locally and the funding required for the set-up of a clinic in this field. It is the perceived prevalence of food hypersensitivity in general that the State and Health Department actually require to plan the expenses involved and logistics required for a food allergy and non-allergic food hypersensitivity clinic. The perceived food hypersensitivity in the age group under study can also be considered as a close measure of the demand for a hypersensitivity clinic in the paediatric population, which could be also applied to the whole population (Steinke et al., 2007).

A food hypersensitivity clinic should include a multidisciplinary approach which incorporates the clinical aspects which tests and analysis the hypersensitivity, the nutritional side which guides patients and their families with adjusting to a diet without the hypersensitivity causing food, and the psychological support to socially cope without the hypersensitivity causing food whilst dealing with possible anxiety especially resulting from IgE-mediated anaphylactic reaction risk (Giovannini et al., 2014).

As an outcome of this research, the Maltese Education division and all the participating schools have been provided with safety recommendations (Appendix K) that not only will contribute to safeguarding the health of children with food hypersensitivity in Maltese schools, but will also provide the school management team, teachers and support assistants with the much needed strategies when faced with food hypersensitivity cases.

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Appendix A: Approval by the Research Ethics Committee of Life Sciences at the University of Chester

Faculty of Life Sciences

Research Ethics Committee

frec@chester.ac.uk

Maria Mariella Porter Abdilla
Gardell Street
Ghaxaq
Malta

24th November 2014

Dear Maria,

Study title:	**The prevalence of parent reported Food Hypersensitivity at school entry in Malta.**
FREC reference:	**981/14/MP/CSN**
Version number:	**1**

Thank you for sending your application to the Faculty of Life Sciences Research Ethics Committee for review.

I am pleased to confirm ethical approval for the above research, provided that you comply with the conditions set out in the attached document, and adhere to the processes described in your application form and supporting documentation. However, the Committee would like to request the following amendments:-

- Consider rewording/clarifying the second hypothesis/research question to focus on "parental perceptions and reporting".

- On the Participant Information Sheet, rephrase the information in 'Why has our school been chosen?' to 'will be *asked to take part* in this study'. Include the time required to complete the questionnaire.

- On the Questionnaire (Food group/others) replace one of the references to chocolate (listed twice) with the correct sub-group. Consider listing colouring, preservatives and pesticide residue as an additional sub-group.

Please forward an amended electronic copy of the documentation to frec@chester.ac.uk

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Application Form	1	October 2014
Appendix 1 – List of References	1	October 2014
Appendix 2 – C.V for Lead Researcher	1	October 2014
Appendices 3, 4 & 5 – Letters of Invitation for Participants	1	October 2014
Appendices 6, 7 & 8 – Participant Information Sheets	1	October 2014
Appendix 9 – Participant Consent Form	1	October 2014
Appendices 10 & 11 - Questionnaire	1	October 2014
Appendix 12 – Letter from Maltese Ministry of Education	1	October 2014
Appendix 13 – Project Flow Chart	1	October 2014
Appendix 14 – Questionnaire Rationale	1	October 2014
Appendix 15 – Written Permission, Maltese Episcopal Conference, Secretariat for Catholic Education	1	October 2014

Please note that this approval is given in accordance with the requirements of English law only. The proposed research is planned to take place in Malta and may need additional approval from the appropriate agencies in Malta. You should seek further advice from the Committee Chair / Secretary or the Research and Knowledge Transfer Office prior to commencing the research.

With the Committee's best wishes for the success of this project.

Yours sincerely,

Dr. Stephen Fallows

Chair, Faculty Research Ethics Committee

Enclosures: Standard conditions of approval.

Cc. Supervisor/FREC Representative

Appendix B: Approval for recommended amendments by the Research Ethics Committee of Life Sciences at the University of Chester

Faculty of Life Sciences

Research Ethics Committee

frec@chester.ac.uk

Maria Mariella Porter Abdilla

Ghaxaq

Malta

11th December 2014

Dear Maria,

Study title: **The prevalence of parent reported Food Hypersensitivity at school entry in Malta.**

FREC reference:981/14/MP/CSN

Version number: **1**

Thank you for providing the documentation for the amendments recommended following the approval of the above application. These amendments have been approved by the Faculty Research Ethics Committee.

- FREC Application Form, version 2
- Questionnaire, version 2
- Questionnaire, Maltese version 2

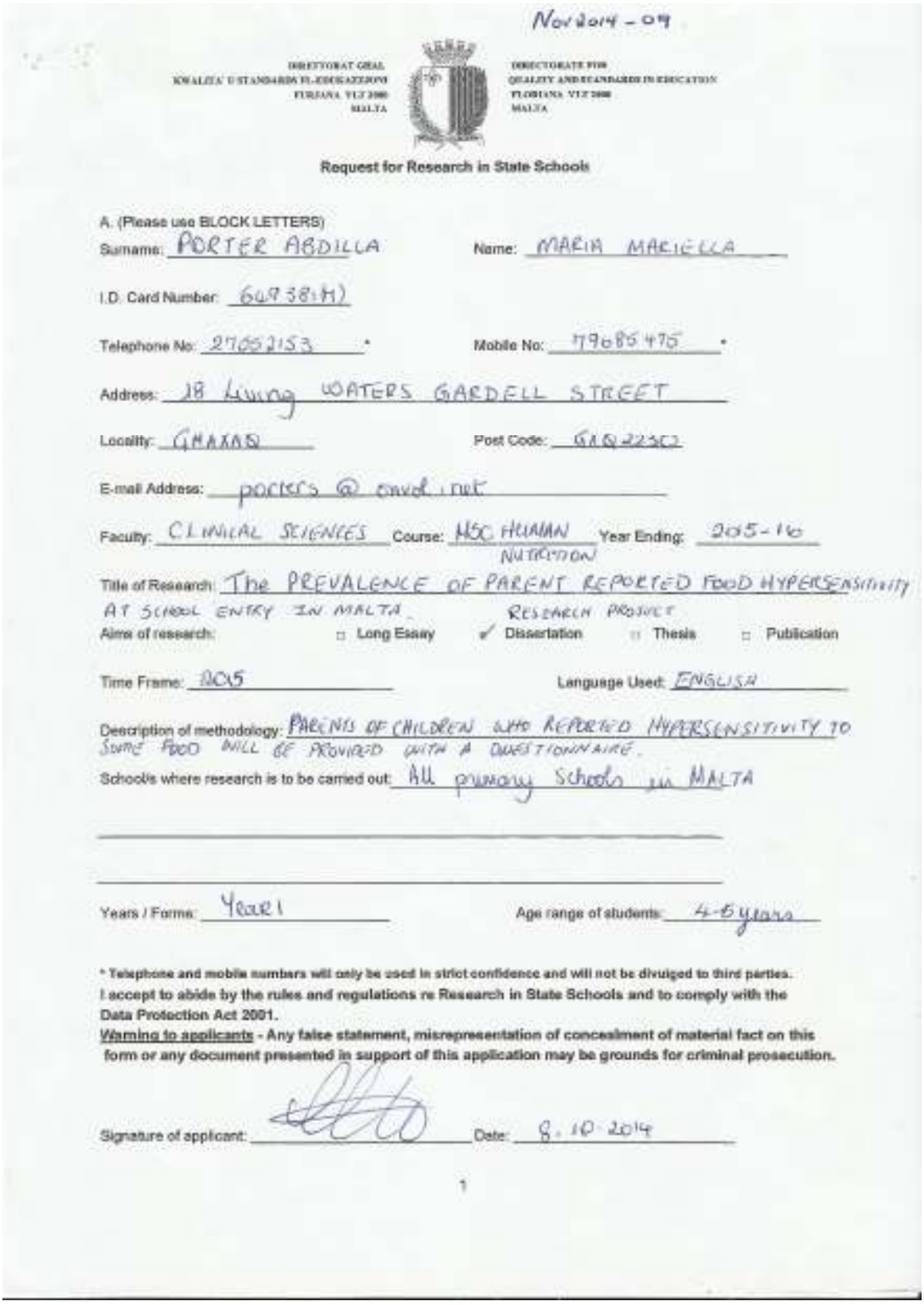
With the Committee's best wishes for the success of this project.

Yours sincerely,

Dr. Stephen Fallows

Chair, Faculty Research Ethics Committee

Appendix C: Approval by the Research and Development Department at the Ministry of Education and Employment



Nov 2014 - 09

DIREZZJONI GHALL-KWALITÀ U STANDARDS FL-EDUKAZZJONI
FURJANA VLT 2000
MALTA

DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
FLORIANA VLT 2000
MALTA

Request for Research in State Schools

A. (Please use BLOCK LETTERS)

Surname: PORTER ABDILLA Name: MARIA MARICELLA

I.D. Card Number: 6097381M

Telephone No: 27052153 * Mobile No: 79685475 *

Address: 18 Living WATERS GARDELL STREET

Locality: GHAXAQ Post Code: GAQ2230

E-mail Address: porters@onvol.net

Faculty: CLINICAL SCIENCES Course: MSC HUMAN NUTRITION Year Ending: 2015-16

Title of Research: The PREVALENCE OF PARENT REPORTED FOOD HYPERSENSITIVITY AT SCHOOL ENTRY IN MALTA

Aims of research: ☐ Long Essay ✓ Dissertation (RESEARCH PROJECT) ☐ Thesis ☐ Publication

Time Frame: 2015 Language Used: ENGLISH

Description of methodology: PARENTS OF CHILDREN WHO REPORTED HYPERSENSITIVITY TO SOME FOOD WILL BE PROVIDED WITH A QUESTIONNAIRE.

Schools where research is to be carried out: All primary schools in MALTA

Years / Forms: Year 1 Age range of students: 4-5 years

* Telephone and mobile numbers will only be used in strict confidence and will not be divulged to third parties.
I accept to abide by the rules and regulations re Research in State Schools and to comply with the Data Protection Act 2001.
Warning to applicants - Any false statement, misrepresentation of concealment of material fact on this form or any document presented in support of this application may be grounds for criminal prosecution.

Signature of applicant: Date: 8.10.2014

1

B. **Tutor's Approval** (where applicable)

The above research work is being carried out under my supervision.

Tutor's Name: _____ Signature: _____

Faculty: _____ Faculty Stamp: _____

C. **Directorate for Quality and Standards in Education - Official Approval**

The above request for permission to carry out research in State Schools is hereby approved according to the official rules and regulations, subject to approval from the University of Malta Ethics Committee.

RESEARCH AND DEVELOPMENT
DEPARTMENT
Ministry for Education and Employment
Floriana VLT 2000

_____ Date: 18 / 11 / 2014 Official Stamp

Director
(Research and Development Department)

Louis Scerri
Assistant Director
Research and Development
Department

Conditions for the approval of a request by a student to carry out research work in State Schools

Permission for research in State Schools is subject to the following conditions:

1. The official request form is to be accompanied by a copy of the questionnaire and / or any relevant material intended for use in schools during research work.
2. The original request form, showing the relevant signatures and approval, must be presented to the Head of School.
3. All research work is carried out at the discretion of the relative Head of School and subject to their conditions.
4. Researchers are to observe strict confidentiality at all times.
5. The Directorate for Quality and Standards in Education reserves the right to withdraw permission to carry out research in State Schools at any time and without prior notice.
6. Students are expected to restrict their research to a minimum of students / teachers / administrators / schools, and to avoid any waste of time during their visits to schools.
7. As soon as the research in question is completed, the Directorate for Quality and Standards in Education assumes the right to a full copy (in print/on C.D.) of the research work carried out in State Schools. **Researchers are to forward the copies to the Assistant Director, International Research, Directorate for Quality and Standards in Education.**
8. Researchers are to hand a copy of their Research in print or on C.D. to the relative School/s.
9. In the case of video recordings, researchers have to obtain prior permission from the Head of School and the teacher of the class concerned. Any adults recognisable in the video are to give their explicit consent. Parents of students recognisable in the video are also to be requested to aprove that their siblings may be video-recorded. Two copies of the consent forms are necessary, one copy is to be deposited with the Head of School, and the other copy is to accompany the Request Form for Research in State Schools. Once the video recording is completed, one copy of the videotape is to be forwarded to the Head of School. The Directorate for Quality and Standards in Education reserves the right to request another copy.
10. The video recording's use is to be limited to this sole research and may not be used for other research without the full consent of interested parties including the Directorate for Quality and Standards in Education.

Appendix D: Approval by the Secretariat for Catholic Education

MALTESE EPISCOPAL CONFERENCE
Secretariat for Catholic Education

The Head
All Church Schools (Primary)

17th November, 2014

Ms Maria Mariella Porter Abdilla, currently reading for a MSc. Human Nutrition at the University of Chester UK, requests permission to conduct a questionnaire with parents of Year 1 students that reported Food Hypersensitivity.

The Secretariat for Catholic Education finds no objection for Ms Maria Mariella Porter Abdilla to carry out the stated exercise subject to adhering to the policies and directives of the schools concerned.

Rev Dr. Charles Mallia
Delegate for Catholic Education

Appendix E: Letter of invitation to all Primary schools in Malta

26th December, 2014

To the Head of School

I the undersigned, an MSc Human Nutrition student from the Department of Clinical Sciences at the University of Chester UK, would like to invite your school to participate in a research project entitled 'The prevalence of parent reported Food Hypersensitivity at school entry in Malta'.

This study has been reviewed and received ethics clearance through the Directorate of Quality and Standards in Education Malta, and the Faculty of Life Sciences Research Ethics Committee Chester UK.

Attached kindly find a 'Participant school information sheet' aimed at answering questions about this study, together with a copy of the questionnaire.

Should you have any further queries, do not hesitate to contact me.

Kindly confirm your school's participation in this study, by signing the attached consent form and sending it on the email address showing here-under.

Thank you for your cooperation.

Yours sincerely

Maria Mariella Porter Abdilla B. Ed (Hons) Biology & Chemistry

MSc Human Nutrition student

Contact number: 00356 79685475

Email address: 1210919@chester.ac.uk

Appendix F: Participant school information sheet

Participant school information sheet

The prevalence of parent reported Food Hypersensitivity at school entry in Malta

Your school is being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with other School Management Team members if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?

This research is being undertaken on children whose parents report Food Hypersensitivity in the Health information sheet provided by the school at the beginning of the scholastic year. The primary aim of this study is to find the prevalence of parent reported Food Hypersensitivity in Year 1 children. This will be followed by finding which foods are causing these reactions, and how their occurrence compares with that in other countries.

Why will our school be asked to take part in this study?

All primary schools in Malta will be involved in this study.

Does our school have to take part?

Your school's participation would help in obtaining a better result of the true Food Hypersensitivity occurrence in Malta at compulsory school entry. Yet, we will leave it up to your discretion as to whether or not your school should take part. If you decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect you in any way.

What will happen if the school takes part?

The School Management Team will be asked for the number of students in Year 1 whose parents have reported Food Hypersensitivity in the Health information sheet. Once these children have been identified a self-completion questionnaire will be provided for their parents. Class teachers, learning Support Assistants and/or Inclusion Coordinators can be involved in forwarding these questionnaires to the parents involved.

What are the possible disadvantages and risks of taking part?

There are no disadvantages or risks foreseen in taking part in the study.

What are the possible benefits of taking part?

By taking part, your school will be contributing towards increased knowledge on how frequent Food Hypersensitivity is in Malta and which foods are causing such reactions. This information will be used to encourage the publication of guidelines that would protect children with food hypersensitivity in schools. The setting up of a structured National system of testing for Food Hypersensitivity followed by support to both children and their parents will also be put forward.

What if something goes wrong?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact Professor Sarah Andrew, Dean of the Faculty of Life Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ, 01244 513055.

Will my taking part in the study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential so that only the researcher carrying out the research will have access to such information.

What will happen to the results of the research study?

The results will be written up into a report for the final project of my Masters in Science. Individuals who participate will not be identified in any subsequent report or publication.

Who is organising the research?

The research is conducted as part of an MSc in Human Nutrition within the Department of Clinical Sciences and Nutrition at the University of Chester. The study is organised with supervision from the department, by Maria Mariella Porter Abdilla.

Who may I contact for further information?

If you would like more information about the research before you decide whether or not you would be willing to take part, please contact:

1210919@chester.ac.uk

Thank you for your interest in this research.

Appendix G: School participation consent form

The Prevalence of parent reported Food Hypersensitivity at school entry in Malta.

Head of School Consent

I certify that I have received sufficient information on this research into children's Food Hypersensitivity and wish to have our school participate.

_____ _____

School Head of School signature

The Prevalence of parent reported Food Hypersensitivity at school entry in Malta.

Head of School Consent

I certify that I have received sufficient information on this research into children's Food Hypersensitivity and wish to have our school participate.

_____ _____

School Head of School signature

Kindly return one signed copy.

Appendix H: Letters of invitation to parents who had reported food hypersensitivity

(English and Maltese versions)

16th January 2015

Dear Parent / Guardian

I the undersigned, an MSc Human Nutrition student from the Department of Clinical Sciences at the University of Chester UK, would like to invite you to participate in a research project entitled 'The prevalence of parent reported Food Hypersensitivity at school entry in Malta'.

This study has been reviewed and received ethics clearance through the Directorate of Quality and Standards in Education Malta, and the Faculty of Life Sciences Research Ethics Committee Chester UK.

Attached kindly find a 'Participant parent information sheet' aimed at answering questions about this study. Should you have any further queries, do not hesitate to contact the school.

Should you decide to participate in this study kindly fill in the attached questionnaire and return to your child's school by the end of next week.

Thank you for your cooperation.

Yours sincerely

Maria Mariella Porter Abdilla B. Ed (Hons) Biology & Chemistry

MSc Human Nutrition student

Email address: 1210919@chester.ac.uk

16 ta' Jannar 2015

Għażiż Ġenitur / Kustodju

Jiena studenta fl-Universita' ta' Chester fl-Ingilterra u qiegħda nagħmel il-kors MSc Human Nutrition fi ħdan id-Dipartiment tax-Xjenzi Kliniċi. Qiegħda nistiednek sabiex tipparteċipa fi proġett ta' riċerka titolat ' Il-prevelanza ta' reazzjoni fiżika għall-ikel irrapurtata mill-ġenituri

fl-ewwel sena skolastika f'Malta.'

Din ir-riċerka ġiet riveduta u verifikata għall-etika fir-riċerka mid-Direttorat għall-Kwalita' u Standards fl-Edukazzjoni f'Malta, u mill-Kumitat ta' Etika fir-Riċerka fi ħdan il-Fakulta ta' Xjenzi Kliniċi ġo Chester fl-Ingilterra.

Mehmuża ma din l-ittra għandek issib karta titolata 'Informazzjoni għall-parteċipant' li twieġeb mistoqsijiet dwar din ir-riċerka. F'każ ikollok bżonn aktar informazzjoni dwar din ir-riċerka tista' tikkuntatja lil amministrazzjoni ta' l-iskola.

Jekk tiddeċiedi li tipparteċipa f'din ir-riċerka jekk jgħoġbok imla il-kwstjonarju mehmuż u irritornah l-iskola ta ibnek/bintek sa l-aħħar tal-ġimgħa ddieħla.

Grazzi tal-kooperazzjoni.

Dejjem tiegħek

Maria Mariella Porter Abdilla B. Ed (Hons) Biology & Chemistry

MSc Human Nutrition

Email address: 1210919@chester.ac.uk

Appendix I: Participant parent information sheet (English and Maltese versions)

Participant parent information sheet

The prevalence of parent reported Food Hypersensitivity at school entry in Malta

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

What is the purpose of the study?

This research is being undertaken on children whose parents reported Food Hypersensitivity in the Health information sheet provided by the school at the beginning of this scholastic year. The primary aim of this study is to find the prevalence of parent reported Food Hypersensitivity (FHS) in Year 1 children. This will be followed by finding which foods are causing these reactions, and how their occurrence compares with that in other countries.

Why have I been chosen?

You have been approached for this study since you reported that your child has a Food Hypersensitivity.

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect you in any way.

What will happen to me if I take part?

You will be provided with a self-completion questionnaire which should not take more than 15 minutes to complete. This includes questions on your child's Food Hypersensitivity.

What are the possible disadvantages and risks of taking part?

There are no disadvantages or risks foreseen in taking part in the study.

What are the possible benefits of taking part?

By taking part, you will be contributing towards increased knowledge on how frequent Food Hypersensitivity is in Malta and which foods are causing such reactions. This information will be used to encourage the publication of guidelines that would protect children with food hypersensitivity in schools. The setting up of a structured National system of testing for Food Hypersensitivity followed by support to both children and their parents will also be put forward.

What if something goes wrong?

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact Professor Sarah Andrew, Dean of the Faculty of Life Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ, 01244 513055.

Will my taking part in the study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential so that only the researcher carrying out the research will have access to such information.

What will happen to the results of the research study?

The results will be written up into a report for the final project of my Masters in Science. Individuals who participate will not be identified in any subsequent report or publication.

Who is organising the research?

The research is conducted as part of an MSc in Human Nutrition within the Department of Clinical Sciences and Nutrition at the University of Chester. The study is organised with supervision from the department, by Maria Mariella Porter Abdilla.

Who may I contact for further information?

If you would like more information about the research before you decide whether or not you would be willing to take part, please contact: 1210919@chester.ac.uk

Thank you for your interest in this research.

Informazzjoni għall-Parteċipant

Il-Prevelanza ta’ reazzjoni fiżika għall-ikel irrapurtata mill-ġenituri fl-ewwel sena skolastika f’Malta

Qed tiġi mistieden/mistiedna sabiex tipparteċipa fi studju ta’ riċerka. Qabel tiddeċiedi, hu importanti li inti tifhem għaliex qed issir din ir-riċerka u x’tinvolvi. Jekk jogħġbok ħu l-ħin meħtieġ sabiex taqra l-informazzjoni hawn taħt u tiddiskutiha ma' oħrajn jekk tħoss il-bżonn. Jekk taħseb li hemm xi ħaġa li mhix ċara jew tixtieq aktar informazzjoni, staqsina. Ħu l-ħin tiegħek sabiex tiddeċiedi jekk għandekx tieħu sehem.

Grazzi talli qrajt din l-informazzjoni.

X’inhu l-għan ta’ din ir-riċerka?

Din ir-riċerka qed issir fuq tfal li l-ġenituri tagħhom irrappurtaw reazzjoni fiżika għall-ikel fil-karta ta’ informazzjoni dwar is-saħħa ta’ l-istudent, li tiġi provduta mill-iskola fil-bidu tas-sena skolastika. L-għan ewlieni ta’ dan l-istudju hu li tinstab il-prevelanza ta’ reazzjoni fiżika lejn l-ikel irrapurtata fl-ewwel sena primarja. Barra minn hekk ser jinstab l-aktar ikel li qed jagħmel reazzjoni fiżika lokalment, u dan jiġi mqabbel ma' ċifri f’pajjiżi oħra.

Għaliex ġejt magħżul/a?

Inti ġejt magħżul/a għal din ir-riċerka minħabba li rraportajt li t-tifel/tifla tiegħek għandu/ha reazzjoni fiżika għall-ikel.

Għandi obbligu li nieħu sehem?

Hu f’idejn il-parteċipant li jiddeċiedi jekk jiħux sehem. Jekk tiddeċiedi li tieħu sehem, inti xorta liberu/a li tirtira mingħajr ma tagħti raġuni. Deċiżjoni li tirtira, jew deċiżjoni li ma tiħux sehem mhi ser taffetwak bl-ebda mod.

X’ser jiġri jekk nieħu sehem?

Inti ser tiġi provdut/a bi kwestjonarju li mhux ser jieħu aktar minn ħmistax

il-minuta biex jimtela. Dan jinkludi mistoqsijiet fuq ir-reazzjoni fiżika lejn l-ikel

tat-tifel/tifla tiegħek.

X'inhuma l-iżvantaġġi possibli jew ir-riskji meta nieħu sehem?

Ma hemm l-ebda żvantaġġi jew riskji meta tieħu sehem f'dan l-istudju.

X'inhuma l-benefiċċji jekk nieħu sehem?

Jekk tieħu sehem tkun qed tikkontribwixxi għal aktar għarfien dwar il-prevelanza ta' reazzjoni fiżika lejn l-ikel f'Malta, u liema ikel l-aktar qed iwassal għal dawn ir-reazzjonijiet lokalment. Din l-informazzjoni ser tintuża sabiex tinkoraġġixxi il-publikazzjoni ta' sett ta' linji gwidi li jipproteġu lit-tfal b'reazzjoni fiżika għal ikel fl-iskola. Barra minn hekk se jiġi wkoll issuġġerit it-twaqqif ta' Sistema Nazzjonali strutturata li tittestja r-reazzjonijiet fiżiċi lejn l-ikel, flimkien ma sapport kemm lit-tfal u lill-ġenituri taghhom.

X'nagħmel jekk ikolli xi lment?

Jekk tixtieq tagħmel xi lment jew għandek xi inċertezza fuq kwalunkwe aspett dwar kif ġejt magħżul/a jew trattat/a matul din ir-riċerka, nitolbuk tikkuntatja lill- Professoressa Sarah Andrew, Dean of the Faculty of Life Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ UK, 01244 513055 .

Il-parteċipazzjoni tiegħi tinżamm kunfidenzjali?

Kull informazzjoni li tiġi miġbura dwar it-tifel/tifla tiegħek matul il-kors ta' din ir-riċerka ser tinżamm strettament kunfidenzjali sabiex min qed imexxi din ir-riċerka biss ikollu aċċess għal din l-informazzjoni.

X'ser jiġri bir-riżultai ta' din ir-riċerka?

Ir-riżultati ser jiġu inklużi f'rapport ta' proġett għal programm ta' Masters fix-Xjenza. Individwi li jipparteċipaw m'humiex se jiġu identifikati bl-ebda rapport li jiġi ppubblikat.

Min qed jorganizza din ir-riċerka?

Din ir-riċerka qiegħda ssir bħala parti minn programm ta' MSc Human Nutrition fi ħdan id-Dipartiment ta' Clinical Sciences and Nutrition fl-Università ta' Chester fl-Ingilterra. Dan il-proġett qed jiġi organizzat taħt superviżjoni mill-istess dipartiment, minn Maria Mariella Porter Abdilla.

Lil min nista' nikkuntatja għal aktar informazzjoni?

Jekk għandek bżonn aktar informazzjoni dwar din ir-riċerka qabel tiddeċiedi jekk tiħux sehem, tista' tikkuntatjani fuq:1210919@chester.ac.uk

Grazzi tal-interess tiegħek f'din ir-riċerka.

Appendix J: Questionnaires (English and Maltese versions)

The Prevalence of parent reported Food Hypersensitivity at school entry in Malta

Questionnaire instructions

- Kindly answer the questions in numerical order.
- Answer by putting a cross in one of the squares provided per question, unless instructed to do otherwise.
- You are free to write any remarks or comments on alternative answers in the margin next to the question concerned.
- You can choose to fill in the English or the Maltese version. Feel free to shift language when writing particular words if it is more convenient for you.
- This questionnaire will not take more than 15 minutes to complete.
- Kindly return the questionnaire to your child's school by the end of next week.

Section A	**General Information**

1. **Child's sex**: ☐ 1 Boy ☐ 2 Girl

2. **Age** _____

Section B	Food Hypersensitivity

3. Mark which from the following foods has caused hypersensitivity symptoms.

Food Group	Sub-group (where applicable)
Milk ☐	
Milk products	☐ 1 Hard Cheese ☐ 2 Soft Cheese ☐ 3 Yoghurt ☐ 4 Ice-cream ☐ 5 Other (Specify) _____
Cereals high in gluten	(e.g.: wheat, rye, barley) ☐ Specifiy _____
Cereals low in gluten	(e.g.: buckwheat, corn, maize, oats, rice) ☐ Specify _____
Meat	☐ 1Beef ☐ 2 Chicken /Rooster ☐ 3Duck ☐ 4Quail ☐ 5Horse ☐ 6 Lamb ☐ 7 Pork ☐ 8 Rabbit ☐ 9Turkey
Oily fish	(e.g.: salmon, mackerel and fresh tuna) ☐ Specify which fish _____
White (non-oily) fish	(e.g.: cod, sea bream) ☐ Specify which fish _____
Shell-fish	(scallop, crab, lobster, prawn, urchins, limpets) ☐ Specify _____
Tree nuts	☐ 1 Almond ☐ 2 Brazil nut ☐ 3 Cashew nut ☐ 4 Hazel nut ☐ 5 Pistachio ☐ 6 Walnut
Peanuts ☐	
Seeds	(e.g.: aniseed, sesame, pumpkin, sunflower, poppy) ☐ Specify _____

Group	Sub-group (where applicable)
Beans	☐ 1 Broad beans ☐ 2 Other beans Specify _____
Soya beans or Soya products ☐	
Peas ☐	(e.g.: chickpeas, whole peas) Specify _____
Lentils ☐	
Berries	(e.g.: blueberries, raspberries) ☐ Specify _____
Citrus	(e.g.: grapefruit, lime, lemon, orange, tangerine) ☐ Specify _____
Fruit with stone	☐ 1 Apricot ☐ 2 Cherry ☐ 3 Nectarine ☐ 4 Peach ☐ 5 Plum
Tropical fruit	☐ 1 Avocado ☐ 2 Banana ☐ 3 Coconut ☐ 4 Kiwi ☐ 5 Mango ☐ 6 Papaya ☐ 7 Pineapple ☐ 8 Other Specify _____
Other fruit	☐ 1 Apple ☐ 2 Cherries ☐ 3 Dates ☐ 4 Figs ☐ 5 Grapes ☐ 6 Loquat fruit ☐ 7 Melon ☐ 8 Pears ☐ 9 Pomegranate ☐ 10 Strawberry ☐ 11 Watermelon ☐ 12 Prickly Pears
Vegetables	☐ 1 Artichokes ☐ 2 Asparagus ☐ 3 Aubergines ☐ 4 Beetroot ☐ 5Broccoli ☐ 6 Cabbage ☐ 7 Carrots ☐ 8 Cauliflower ☐ 9 Celery ☐ 10 Cucumber ☐ 11 Garlic ☐ 12 Marrows ☐ 13 Mushrooms ☐ 14 0nions ☐ 15 Parsley ☐ 16 Peppers ☐ 17 Potatoes ☐ 18 Pumpkin ☐ 19 Spinach ☐ 20 Sweet corn ☐ 21 Tomatoes

	☐ 22 Others _____ _____
Eggs	☐ 1 Raw ☐ 2 Cooked ☐ 3 Both
Other food	☐ 1 Added sugar ☐ 2 Tea ☐ 3 Coffee ☐ 4 Chocolate ☐ 5 Snails ☐ 6 Octopus /Squid ☐ 7 Capers ☐ 8 Olives ☐ 9 Chestnuts ☐ 10 Herbs & Spices (e.g.: pepper, curry, basil, nutmeg, mint) Specify _____
Others	☐ 1 Colouring ☐ 2 Preservatives ☐ 3 Pesticide residue

4. **How much of the food causing hypersensitivity can the child tolerate before a reaction is observed? Include reference to the food the child is hypersensitive to, depending on the amount tolerated marked.**

☐ 1 Varying amounts consumed. Food _____

☐ 2 Hypersensitivity onsets with increased intake. Food _____

☐ 3 Cannot have any. Food _____

☐ 4 Unsure of quantity. Food _____

5. **Has your child ever shown any of the following reactions when exposed to the food s/he is sensitive to? (Tick accordingly)**

a) Mild to moderate	b) Severe hypersensitivity
☐ 1 Swollen lips, face or eyes	☐ 8 Hoarse voice, difficulty swallowing, swollen tongue
☐ 2 Itchy or tingling mouth	☐ 9 Difficult or noisy breathing, wheeze or persistent cough
☐ 3Hives (allergic Urticaria) or Itchy skin rash	☐ 10 Nausea or Vomiting
☐ 4 Eyes symptoms	☐ 11 Diarrhoea
☐ 5 Atopic rash or worsening of atopic skin (infantile/atopic eczema)	☐ 12 Persistent dizziness/pale or floppy
☐ 6 Itching in the outer ear	☐ 13 Suddenly sleepy or collapse
☐ 7 Anal rash or itching	☐ 14 Unconcious

6. **Has the Food Hypersensitivity been discussed with any of the following:**

☐ 1 Allergy specialist

☐ 2 Dietitian

☐ 3 Nutritionist

☐ 4Paediatrician

☐ 5 Family Doctor

☐ 6 Other Specify _____

7. **Has a health professional provided you with an Action Plan which explains the First Aid steps that should be followed due to potential other acute reactions in the future?**

☐ 1Yes ☐ 2 No

8. a) **Has the child been tested for hypersensitivity?**

☐ 1 Yes ☐ 2 No

b) **If yes, mark where the tests were done.**

☐ 1 Private clinic ☐ 2 Mater Dei hospital ☐ 3 Other. Specify _____

9. **Has the child been prescribed any of the following in relation to the Food hypersensitivity?**

☐ 1 Adrenaline Auto-injector ☐ 2 Antihistamines ☐ 3 Inhaler

☐ 4 Steroids ☐ 5 Other Specify _____

10. **Do you provide any other form of treatment for the child's hypersensitivity?**

☐ 1 Yes Specify_____ ☐ 2 No

11. a) **Is there any other family member who has the same Food hypersensitivity ?**

☐ 1 Yes ☐ 2 No

b**) Specify the family member.**

☐ 1 Sibling ☐ 2 Mother ☐ 3 Father

☐ 4 Grandparents ☐ 5 Other members. Specify _____

12**. Is there any other family member who shows Food hypersensitivity, not specifically to the one the child shows symptoms to?**

☐ 1 Yes ☐ 2 No

b**) Specify the family member if Yes was marked for 12a**:

☐ 1 Sibling ☐ 2 Mother ☐ 3 Father

☐ 4 Grandparents ☐ 5 Other relatives. Specify _____

Section C	**Other signs of hypersensitivity**

13. **Has the child also shown hypersensitivity to any of the following?**

☐ 1 Antibiotics

☐ 2 Painkillers or antifebrile drugs

☐ 3 Latex ☐ 4 Skin creams

☐ 5 Bee stings ☐ 6 Others Specify _____

14. **Has the child ever been found to also have any of the following hypersensitive reactions in the absence of food?**

☐ 1Asthma ☐ 2 Allergic inflammation of the eyes

☐ 3 Atopic rash / /atopic eczema

☐ 4 Coughing for more than a month without flu ☐ 5 Hay fever / pollen allergy

☐ 6 Hives (allergic Urticaria) Itchy skin rash

☐ 7 Hypersensitivity to any animal fur Specify animal/s. _____

☐ 8 Wheezing

15. **What else would you like to let the researcher know about the child's hypersensitivity, or other related subject?**

_____

_____

_____

_____

Thank you for your time to fill in this questionnaire.

Kindly return to your child's school.

Il-Prevelanza ta' reazzjoni fiżika għall-ikel irrappurtata mill-ġenituri fl-ewwel sena skolastika f'Malta.

Struzzjonijiet għall-Kwestjonarju

- Jekk jogħġbok wieġeb dawn il-mistoqsijiet f'ordni numerika.
- Wieġeb billi tagħmel salib ġo waħda mill-kaxxi provduti f'kull mistoqsija, sakemm ma tiġix mitlub/a differenti.
- Ħossok liberu li tikteb rimarki jew kummenti oħra relatati fl-ispazji vojta kull naħa tal-mistoqsija.
- Agħżel li twiegeb dan il-kwestjonarju bil-Malti jew bl-Ingliż. Fejn tħoss li hemm xi kliem li tafu aktar bil-lingwa opposta ta' dik li qed twieġeb biha, ħossok liberu li tniżżel il-kliem bil-lingwa li tippreferi.
- Dan il-kwestjonarju mhux se joħodlok aktar minn 15-il minuta.
- Jekk jogħġbok irritorna dan il-kwestjonarju l-iskola ta' ibnek/bintek sa l-aħħar tal-ġimgħa ddieħla.

Sezzjoni A	**Informazzjoni Ġenerali**

1. **Sess**: ☐ 1 Tifel ☐ 2 Tifla

2. **Eta'** _____

Sezzjoni B	**Reazzjoni fiżika għall-Ikel**

3. Immarka liema minn dan l-ikel qatt wassal għal reazzjoni fiżika fit-tifel/tifla.

Grupp tal-Ikel prinċipali	**Ikel ieħor (fejn applikabli)**
Ħalib ☐	
Prodotti tal-ħalib	☐ 1 Ġobon iebes ☐ 2 Ġobon artab ☐ 3 Jogurt ☐ 4 Ġelat ☐ 5 Oħrajn. Speċifika _____
Ċereali għoljin fil-glutina	(e.ż.: qamħ, segala, xgħir) ☐ Speċifika. _____
Ċereali baxxi fil-glutina	(e.ż.: qamħ saraċin , qamħirrun, qaraboċċ, ħafur, ross) ☐ Speċifika. _____
Laħam	☐ 1 Ċanga ☐ 2 Tiġieġ / Serduk ☐ 3 Papra ☐ 4 Summien ☐ 5 Żiemel ☐ 6 Ħaruf ☐ 7 Majjal ☐ 8 Fenek ☐ 9 Dundjan
Ħut żejtni	(eż.: salamun, kavalli, tonn frisk) ☐ Speċifika liema ħut_____
Ħut abjad (Ħut mhux żejtni)	(eż.: merluzz, awrat) ☐ Speċifika liema ħut _____
Ħut bil-qoxra	(eż: arzell, granċ, awwista, gambli, rizzi, imħar) ☐ Speċifika liema ħut _____
Nuċi tas-siġar	☐ 1 Lewż ☐ 2 Ġewż tal-Brażil ☐ 3 Ġewz tal-anakardju ☐ 4 Ġellewż ☐ 5 Pistaċċi ☐ 6 Ġewż
Karawett ☐	
Żrieragħ	(e.ż.: aniżetta, ġunġlien, żerriegħa tal-qargħa ħamra, żerriegħa tal-ġirasol, żerriegħa tal-peprin) ☐ Speċifika _____
Fażola	☐ 1 Ful aħdar ☐ 2 Fażola oħra. Speċifika _____

Grupp tal-ikel prinċipali	**Ikel ieħor (fejn applikabbli)**
Sojja jew prodotti tas-sojja. ☐	
Piżelli	(e.ż.: ċiċri, piżelli friska) ☐ Speċifika _____
Għads ☐	
Tut jew Lampun ☐	Speċifika _____
Ċitru	(e.ż.: tronġa, lumi. laringġ, mandolin) ☐ Speċifika _____
Frott bil-għadma	☐ 1 Berquq ☐ 2 Ċirasa ☐ 3 Anċiprisk ☐ 4 Ħawħ ☐ 5 Għanbaqar
Frott tropikali	☐ 1 Avokado ☐ 2 Banana ☐ 3 Kokonut ☐ 4Kiwi ☐ 5 Mango ☐ 6 Papaya ☐ 7 Ananas ☐ 8 Frott ieħor Speċifika _____
Frott ieħor	☐ 1 Tuffieħ ☐ 2 Ċirasa ☐ 3 Tamal ☐ 4 Tin ☐ 5 Għeneb ☐ 6 Naspli ☐ 7 Bettieħ ☐ 8 Langas ☐ 9 Rummien ☐ 10 Frawli ☐ 11 Dulliegħ ☐ 12 Bajtar tax-Xewk
Ħaxix	☐ 1 Qaqoċċ ☐ 2 Asparagus ☐ 3 Brunġiel ☐ 4Pitravi ☐ 5 Brokkoli ☐ 6 Kaboċċi ☐ 7 Karrotti ☐ 8 Pastard ☐ 9 Karfus ☐ 10 Ħjar ☐ 11 Tewm ☐ 12 Qarabali ☐ 13 Faqqiegħ ☐ 14 Basal ☐ 15 Tursin ☐ 16 Bżar ☐ 17 Patata ☐ 18 Qargħa ħamra ☐ 19 Spinaċi ☐ 20 Qamħ ħelu ☐ 21 Tadam ☐ 22 Ħaxix ieħor _____ _____

Bajd	☐ 1 Nej ☐ 2 Imsajjar ☐ 3 Nej u msajjar
Ikel ieħor	☐ 1 Zokkor miżjud ☐ 2 Te ☐ 3 Kafe ☐ 4 Ċikkulata ☐ 5 Bebbux ☐ 6 Qarnit /Klamari ☐ 7 Kappar ☐ 8 Żebbuġ ☐ 9 Qastan ☐ 10 Ħwawar (e.ż.: bżar, kari, ħabaq, noċemuskata, nagħniegħ) Speċifika_____
Oħrajn	☐ 1Kulur miżjud ☐ 2 Preservattiv ☐ 3 Traċċi ta' Pestiċidi

4**. Kemm minn dak l-ikel li jagħmel reazzjoni fizika jista' t-tifel jew tifla jikkonsma qabel ikun hemm reazzjoni? Inkludi referenza għall-ikel li hemm sensittivita eċċessi għalih skond il-livell tollerat.**

☐ 1 Ammonti varji. Ikel _____.

☐ 2 Ir-reazzjoni tiżdied aktar ma jiġi kkunsmat minn dan l-ikel. Ikel _____.

☐ 3 Ma jista' jieħu l-ebda ammont. Ikel _____.

☐ 4 Minix ċert/a dwar l-ammont. Ikel _____.

5. **It-tifel/ tifla qatt wera xi sintomu minn dawn meta kiel jew ġie f'kuntatt ma l-ikel li mmarkajt f'mistoqsija numru 3? (Agħmel salib ħdejn is-sintomu/i involuti)**

a) Ħafif għal Moderat	**b) Reazzjoni severa**
☐ 1 Nefħa fix-xufftejn, għajnejn jew wiċċ	☐ 8 Ħanqa, problema biex tibla jew nefħa fl-ilsien
☐ 2 Tingiż jew ħruq fil-ħalq	☐ 9 Problemi ta' nifs, tħarħir man-nifs jew sola kontinwa
☐ 3 Urtikarja jew raxx ta' ħruq fil-ġilda	☐ 10 Dardir jew rimettar
☐ 4 Sintomi fl-għajnejn eż.: ħruq	☐ 11 Dijarea
☐ 5 Raxx fil-ġilda / raxx atopiku jew ekżema	☐ 12 Sturdament kontinwu , ħedla, jew sfura.
☐ 6 Ħruq fil-parti ta' barra tal-widna	☐ 13 Għejja f'daqqa jew kollass
☐ 7 Raxx jew ħruq fit-tarf tal-musrana l-kbira wara l-ippurgar	☐ 14 Tintilef minn sensiha

6. **Is-sensittività lejn l-ikel qatt ġiet diskussa ma' xi ħadd minn dawn?**

☐ 1 Speċjalista ta' l-allerġiji

☐ 2 Dietista

☐ 3 Nutrizzjonista

☐ 4 Pedjatra

☐ 5 Tabib tal-Familja

☐ 6 Oħrajn. Speċifika _____

7. **Ġejtu provduti bi Pjan ta' Azzjoni minn professjonist mediku dwar l-ewwel għajnuna li t-tifel/tifla għandu jingħata minħabba riskju ta' reazzjonijiet aktar akuti fil-futur?**

☐ 1 Iva ☐ 2 Le

8. a) **Għamiltu xi testijiet għar-reazzjoni eċċessiva lejn l-ikel?**

☐ 1 Iva ☐ 2 Le

b) **Jekk Iva, mmarka fejn saru t-testijiet.**

☐ 1 Klinika privata ☐ 2 Sptar Mater Dei ☐ 3 Oħrajn. Speċifika _____

9. **Qatt ġiet preskritta xi mediċina minn dawn b'relazzjoni mas-sensittività eċċessiva tat-tifel/tifla lejn l-ikel?**

☐ 1 Awto-injezzjoni tal-Adrenalina ☐ 2 Antistamini ☐ 3 Inalatur

☐ 4 Sterojdi ☐ 5 Mediċini oħra _____

10. **Tagħtu xi trattamenti oħrajn lit-tifel/tifla għas-sensittività lejn l-ikel?**

☐ 1 Iva. Speċifika _____ ☐ 2 Le

11. a) **Hemm xi membru ieħor tal-familja li għandu reazzjoni għall-istess ikel?**

☐ 1 Iva ☐ 2 Le

b**) Speċifika min hu l-membru tal-familja.**

☐ 1 Aħwa ☐ 2 Omm ☐ 3Missier

☐ 4 Nanniet ☐ 5 Membri oħrajn. Speċifika _____

12. a) **Hemm xi membru tal-familja li juri sensittività fiżika għal xi ikel, mhux neċessarjament l-istess ikel li jaffettwa lit-tifel/tifla?**

☐ 1Iva ☐ 2 Le

b**) Speċifika liema membru tal-familja jekk immarkajt 'Iva' għal 12 (a).**

☐ 1 Aħwa ☐ 2 Omm ☐ 3Missier

☐ 4 Nanniet ☐ 5 Membri oħrajn. Speċifika _____

Sezzjoni Ċ	**Sinjali oħra ta' reazzjoni fiżika**

13. **Qatt it-tifel/tifla wera reazzjoni fiżika għal xi wħud minn dawn?**

☐ 1 Antibijotiċi ☐ 2 Analġeżiċi u mediċini biex iniżżlu d-deni

☐ 3 Latex ☐ 4 Kremi tal-ġilda

☐ 5 Gdim ta' naħal ☐ 6 Oħrajn. Speċifika_____

14. **Qatt it-tifel/tifla wera xi reazzjoni fiżika minn dawn mingħajr konnessjoni ma l-ikel?**

☐ 1 Ażżma ☐ 2 Infjammazzjoni allerġika fl-għajnejn

☐ 3 Raxx atopiku / ekżema atopika

☐ 4 Sogħla għal aktar minn xagħar mingħajr deni

☐ 5 'Hay fever' / Allerġija għall-pollin

☐ 6 Ħorriqija (Hives), Urtikarja, jew raxx ta' ħakk fil-ġilda

☐ 7 Reazzjoni fiżika għall- pil ta' xi annimal/i. Speċifika l-annimal/i. _____

☐ 8 Tħarħir fin-nifs

15. **Hemm xi ħaġa oħra li tixtieq tinforma lir-riċerkatur dwarha fir-rigward tas-sensittività fiżika tat-tifel/tifla għall-ikel?**

_____

_____

_____

_____

Grazzi tal-ħin tiegħek sabiex timla dan il-kwestjonarju.

Jekk jogħġbok irritornah l-iskola ta' ibnek/bintek.

Appendix K: Food hypersensitivity safety recommendations for Maltese schools

Food Hypersensitivity in Maltese schools.

Safety Recommendations.

Maria Mariella Porter Abdilla

Follow up of MSc Human Nutrition Research

at the Department of Clinical Sciences & Nutrition, University of Chester, UK.

Glossary of main terms used.

Food Allergy: An immune response to food where symptoms usually appear in a short period after contact with or consumption of food. Symptoms can vary from skin rash to anaphylaxis (a life-threatening allergic reaction).

Food Aversion: A strong feeling of dislike or fear to consume some food, with no underlying allergic or non-allergic hypersensitivity.

Food Hypersensitivity (FHS): A general term used to refer to any adverse reaction to food.

Non-Allergic Food Hypersensitivity (intolerance): Is the body's reaction to natural or artificial chemicals in food or enzyme deficiencies, where the body's immune system is not involved. Symptoms usually occur hours or even days after eating the food.

A. Identification of students with Food Hypersensitivity

- Parents/guardians should inform the School Management Team (SMT) about a child's food hypersensitivity (FHS). Other school personnel working with the child should be informed about the FHS. This includes the class teacher, other teachers or Learning Support Assistant/s (LSA/S) in the same class. In the case of a severe food allergy this information can be spread with other school members and a whole school approach can also be taken.

- Food hypersensitivity bracelets and tag labels can be used especially in the case of young children. This can act as a reminder for their teacher/s about the FHS, and it is especially useful when there are inter-classroom activities or change of class teacher.

B. Individual Action Plan

- Each child with food hypersensitivity should have a plan which clearly states which food the child is hypersensitive to. In case of a life-threatening food allergy an emergency action plan should also be implemented.

C. Creating a safe environment

<u>The following are steps that should be followed in all cases of Food hypersensitivity:</u>

- All school students and staff members always wash their hands with soap and water before and after eating their lunch.
- The child with a FHS should have the desk cleaned with soap and water before eating, and his place should be one which provides the least risk of possible cross-contamination with other students' lunches.
- A child with a FHS would only consume the food the parents/guardians provide or give consent to be eaten.
- Young children with FHS are supervised during lunch time.
- Birthdays are celebrated with plain cupcakes rather than decorated cakes to reduce the risk of cross contamination when cutting cakes with many ingredients. In the case of hypersensitivity to ingredients such as wheat, the cupcake is given to the non-hypersensitive students in the same class last thing during the day and consumed at home.
- All students are educated about food hypersensitivity using age appropriate educational material and taught not to share food.

The following are steps that should be followed according to the type of Food hypersensitivity:

i. In the case of life-threatening allergies to food which is not vital in the diet of other children during school hours e.g.: fish, peanuts or nuts

- A whole school allergen free approach can be taken, especially if the child is very young. This highly reduces the risk of possible cross contamination which endangers the child's life through consumption, or an allergic reaction through contact with the allergen.
- All the school personnel including teachers, clerical and domestic staff, together with all the students' parents should be informed about the school's approach towards the life-threatening allergy case so that no food items containing the allergen are brought to school.
- All school activities should avoid including the allergen in food or non-food items.
- Signs within the main school areas e.g.: main entrance, hall and staffrooms can indicate that this school is free from the life-threatening allergen e.g.: 'This is a nut free zone.'

ii. **In the case of life-threatening allergies for food which is difficult to eliminate from the diet of other children during school hours e.g.: wheat or milk.**

- A class or individual approach can be taken to reduce the risk of possible cross contamination which endangers the child's life through consumption, or an allergic reaction through contact with the allergen. A whole school allergen free approach might not be practical in this case.
- Class activities should avoid using the food causing the allergy. Where possible, whole school activities should avoid using the allergen in food and non-food items.

iii. Non-allergic food hypersensitivity (intolerance) and food aversion

- It must be ensured that the child does not consume the food s/he is hypersensitive to. Physical contact with the food should not cause hypersensitivity if the reaction is of a purely non-allergic nature.

iv. Coeliac disease

- Whilst cross contamination does not result in an immediate life-threatening situation, constant cross contamination with gluten results in adverse effects on the child's health and possible relapse. Hence it has to be ensured that cross- contamination is eliminated as much as possible especially through sanitary steps.

v. Genetic Metabolic Diseases and Special diets

- Certain genetic metabolic diseases such as Phenylketonuria, Galactosemia and Glucose-6-Phosphate (G6PD) deficiency, require strict elimination of certain food in the diet or a special diet. Consumption of the forbidden food can have adverse effect on the child's health and should be strictly eliminated.